PHOTOFACT* FOLDER SET

*TRADE MARK

NO. 82

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The PHOTOFACT Servicer

January 3, 1950 ★ *Published for all users of Howard W. Sams' Photofact Folders* ★ Vol. 9, Nos. 81 & 82

HERE'S ANOTHER DIVIDEND

The two schematics attached to this Servicer have been requested in our exclusive "Standard Notation Form". They cover two more TV sets that have not been covered by regular PHOTOFACT Folders. There will be more of these - issued as a part of the Servicer, - extra dividends for you.

* * *

COLOR TELEVISION

Yes, we're keeping up to date on the development of Color Television. We won't attempt to evaluate the systems. That is the work of the FCC.

What we are doing, and will continue to do, is to be aware of all the developments so that when a decision is made as to what type of Color Television system will be used by the Industry's great manufacturing facilities, we will be in position to bring dependable data to you.

We have been in Washington to observe Color tests, and we are going back every few weeks until such time as a decision is reached by the FCC. We have collected much data and information. This information will be passed on to you when it is determined how much of it pertains to the final Color system.

* * *

The November 5th issue of Martin Codel's Television Digest, published in Washington, D. C., had one of the best summations on the subject we have read. With his permission, this copyrighted article is quoted.

"THE DREAMERS & THE BUILDERS: What do we, personally, think about the color TV issue as it has been unfolding here in Washington?

"We've resisted answering this insistent inquiry from troubled friends until we thought the color hearings had gone far enough to warrant editorializing.

"They have - - and the opinions here expressed represent the consensus of our staff, who have covered every facet of the 'color case', listened to every word of testimony or read every page of the record, seen every demonstration, talked to every principal involved.

"In our book, the whole color business is premature, based on an exaggerated ideal in the minds of a very few people - - and it has resulted in an unnecessary and destructive prolongation of the freeze.

"We don't think anybody's color is ready, or even in early prospect.

"Danger, as we see it, is that the FCC, rather than giving public color TV, could really wind up killing off what TV the public now enjoys - - a tragic abortion of the country's most promising and exciting postwar industry.

\- - -

"Compatibility is the key. And the telecaster is the critical man today. He can't afford to start again building new audience from scratch. He's having tough enough going now, financially, without adding to that burden. He and his 'circulation managers', the manufacturers and sellers and servicemen, deserve encouragement rather than harassment.

"The incompatible system proposed has limitations clearly visible and serious. Aside from requiring conversion of existing sets just to get black-and-white - - and there would be 5,000,000 or maybe 10,000,000 sets in use by the time anybody got around to putting it into substantial operation - - it's a retrogression from today's excellent monochrome in that:

"(1) It halts growth of direct-view picture size, is limited to what will soon be considered a small screen, flies in face of an unmistakable trend to larger screens.

"(2) Definition of the picture, or ability to show detail, is far less than that of today's black and white.

"Those who offer compatibility are obviously unready. The infant TV has enough natural growing pains now without adding artificial ones. Let it gain some strength first.

- - -

"What's so urgent about color? Who's demanding it? Who would pay good money for it in its present size and state?

"Actually, only a handful of people were 'sold' on its immediacy - - and we wonder whether most of them still are. The record, and preponderant industry opinion, certainly argue for a natural and gradual evolution toward color - - not its adoption in a hurry by fiat.

"A basic fallacy of the whole fracas is theory that color is the ultimate in TV. Even the color-later forces have mistakenly subscribed to it. Who knows what new development the inventive genius of the electronic industry will bring forth? How about tri-dimensional TV, for example? And what if it's incompatible? Are we to stop everything every time a promising development appears - - while risk capital goes elsewhere in disillusionment?

"Depressing in a way is the strange element of fear pervading the issue - - a fear totally out of place in an industry of such basic vitality. FCC is afraid of Sen. Johnson; industry afraid of FCC; RCA-NBC afraid to offend anyone; CBS afraid of missing out on a long-shot. Rare indeed is the man who stands up and says what he thinks, or has courage to change his mind and admit he was wrong.

"In their excess of zeal, the color-now proponents are actually doing themselves a disservice: The politicians, by tackling something too complicated to be made a popular issue or to be the basis of charges of collusion in so highly competitive an industry. The incompatible system folk, by helping prolong the freeze and retarding the spread of their own as well as others' TV facilities.

"The political power, if they choose to exert it, is without doubt overwhelmingly on the side of:

"(a) The telecasters, who urgently need more stations, more markets, more networking - - and who would be up in arms over the Washington goings-on if they were really organized. (Meanwhile, the anti-TV broadcasters chortle.)

"(b) The makers and vendors and servicers of receivers, whose $1 billion 1949 business may be doubled next year - - a factor in the nation's economy that cannot be blinked away. They, too, almost to a man, resent the confusion caused by all this color talk.

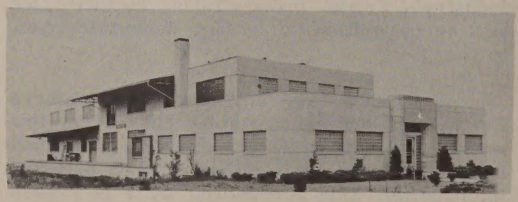
"(c) The labor unions, whose leaders are beginning to visualize tens of thousands of new jobs melting because of artificial governmental restraints.

"These, in addition to millions of bewildered TV set owners and prospective purchasers of TV sets.

- - -

"Let's get on with the allocations (really a tough problem) and then build, build, build. That's the job at hand. In the words of Comr. Hennock, before these hearings, the 'important thing now is to get stations on the air; whether they're monochrome or polychrome is secondary'."

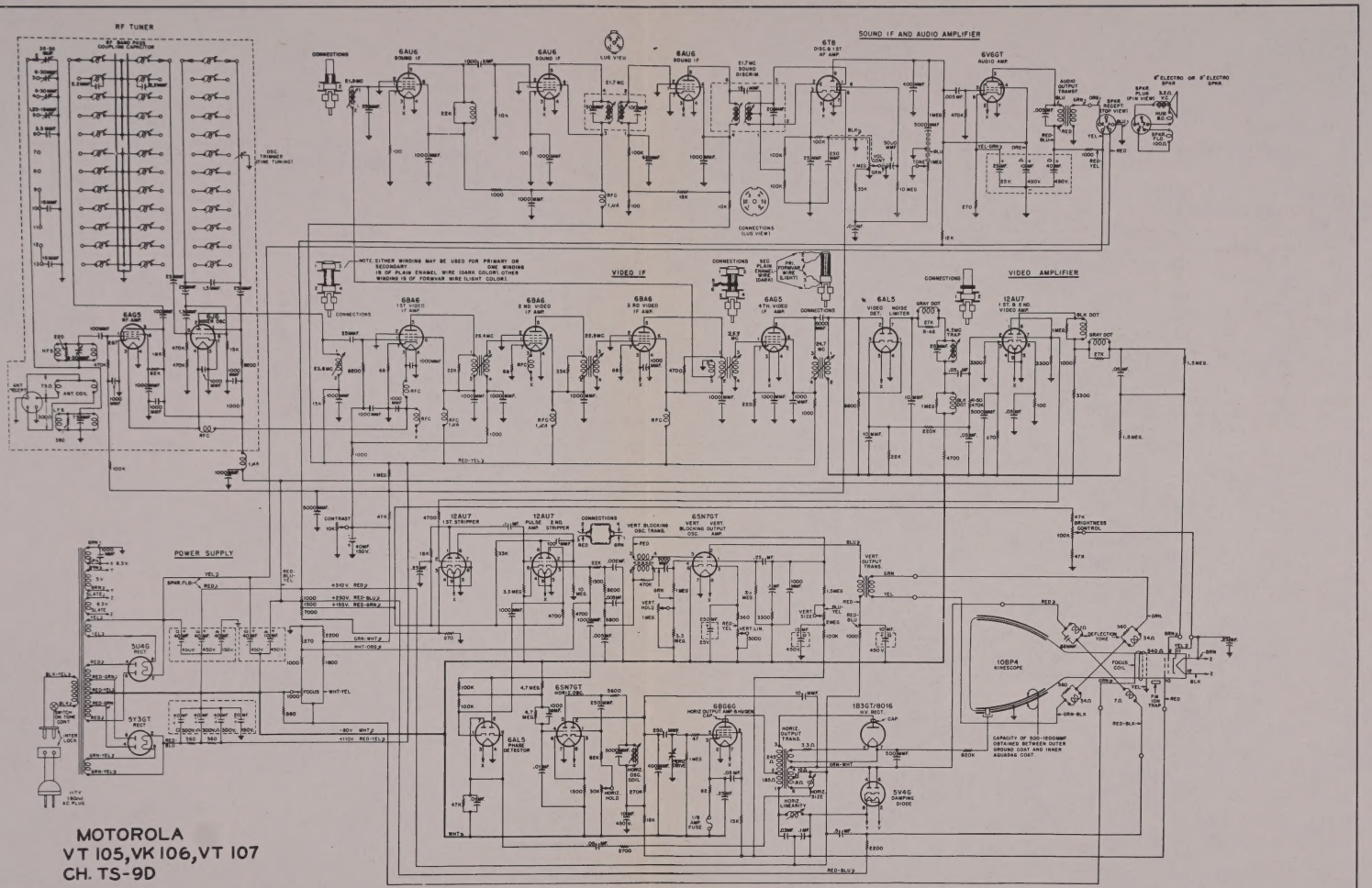
* * *



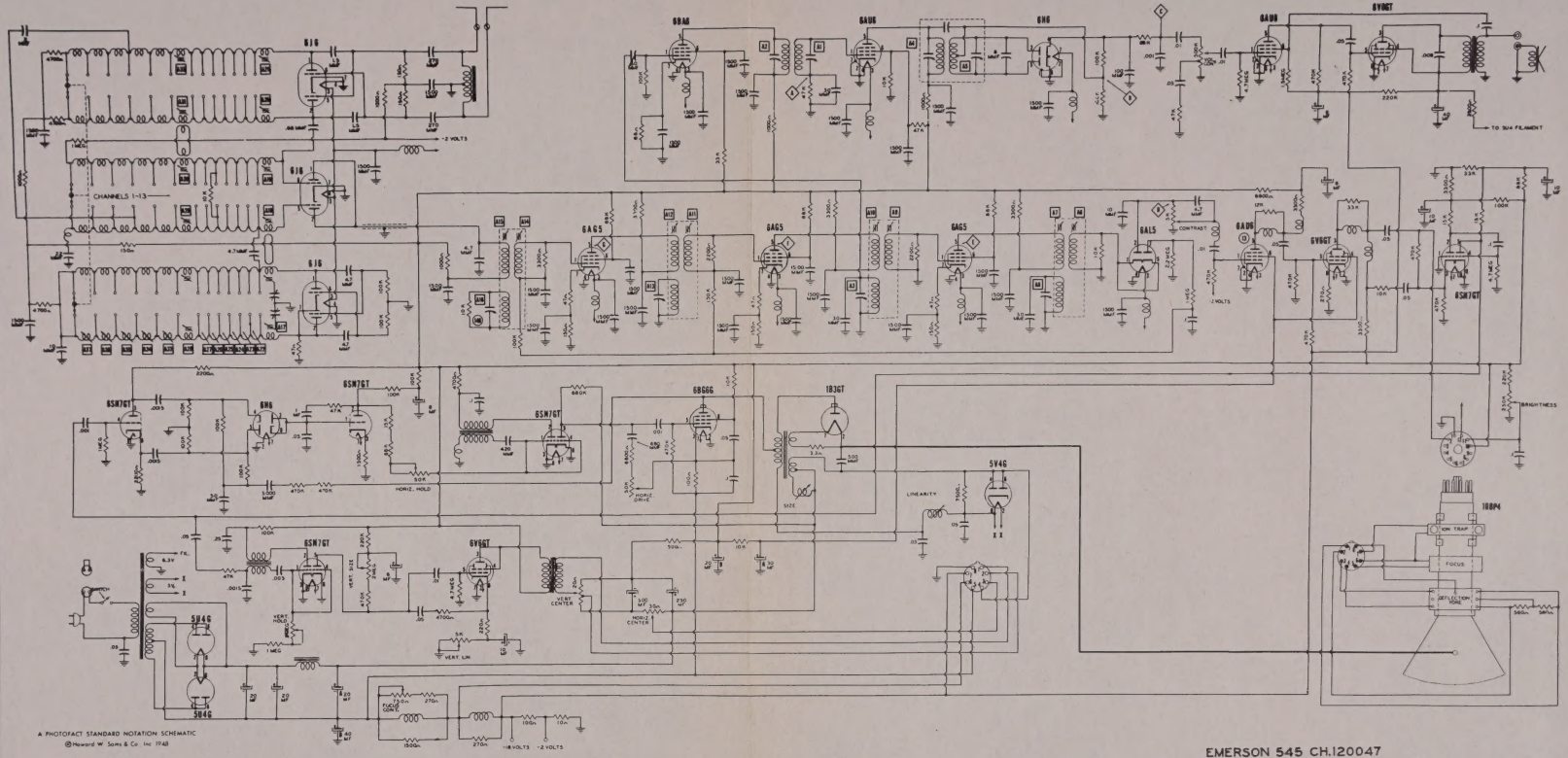
WE'RE MOVING

We've been bothered by growing pains. In three years, we've sprouted like Topsy, first in one location, then in two and recently in four separate buildings. So now we are moving into a new home of our own. A big, handsome building in which we can consolidate all of our activities and operations to serve you better than ever. We are not unmindful that we owe our growth and expansion to your generous support. Thanks to you, we shall be adequately and advantageously housed after January 1, 1950

2201 East 46th Street, Indianapolis 5, Indiana


RF TUNER
SOUND IF AND AUDIO AMPLIFIER
VIDEO IF
VIDEO AMPLIFIER
POWER SUPPLY
6AU6 SOUND IF
6AU6 SOUND IF
6AU6 SOUND IF
6T8 DISC & 1ST AF AMP
6V6GT AUDIO AMP
6BA6 1ST VIDEO IF AMP
6BA6 2 ND VIDEO IF AMP
6BA6 3 RD VIDEO IF AMP
6AG5 4TH VIDEO IF AMP
6AL5 VIDEO DET. NOISE LIMITER
12AU7 1 ST & 2 ND VIDEO AMP
12AU7 1ST SYNC
12AU7 PULSE & 2 ND SYNC AMP STRIPPER
6SN7GT VERT. BLOCKING OSC. TRANS.
6SN7GT VERT. BLOCKING OUTPUT OSC AMP
6AL5 PHASE DETECTOR
6SN7GT HORIZ. OSC.
6BG6G HORIZ OUTPUT AMP & HV DIOD
1B3GT/8016 H.V. RECT.
5V4G DAMPING DIODE
5U4G RECT.
5Y3GT RECT.
10BP4 KINESCOPE
DEFLECTION YOKE
FOCUS COIL
HORIZ. OUTPUT TRANS.
VERT. OUTPUT TRANS.
BRIGHTNESS CONTROL
CONTRAST
VOL. CONT.
HORIZ. HOLD
VERT. HOLD
VERT. SIZE
HORIZ. LINEARITY
1/8 AMP FUSE
SPKR. FLD.
ANT. COIL
OSC. TRIMMER (FINE TUNING)
CONNECTIONS (LUG VIEW)
CAPACITY OF 500-1200MMF OBTAINED BETWEEN OUTER GROUND COAT AND INNER AQUADAG COAT.
NOTE: EITHER WINDING MAY BE USED FOR PRIMARY OR SECONDARY. ONE WINDING IS OF FLASH ENAMEL WIRE (DARK COLOR); OTHER WINDING IS OF FORMVAR WIRE (LIGHT COLOR).
NOTE: RESISTORS ARE INDICATED IN OHMS. K=1000 (ONE THOUSAND) OHMS.
ANY RED, WHT & BLU WIRES ARE SUBSTITUTES.

MOTOROLA
VT 105, VK 106, VT 107
CH. TS-9D



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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EMERSON 545 CH.120047

PHOTOFACT* Folder

*TRADE MARK

AIRLINE MODEL
84GSE3011A

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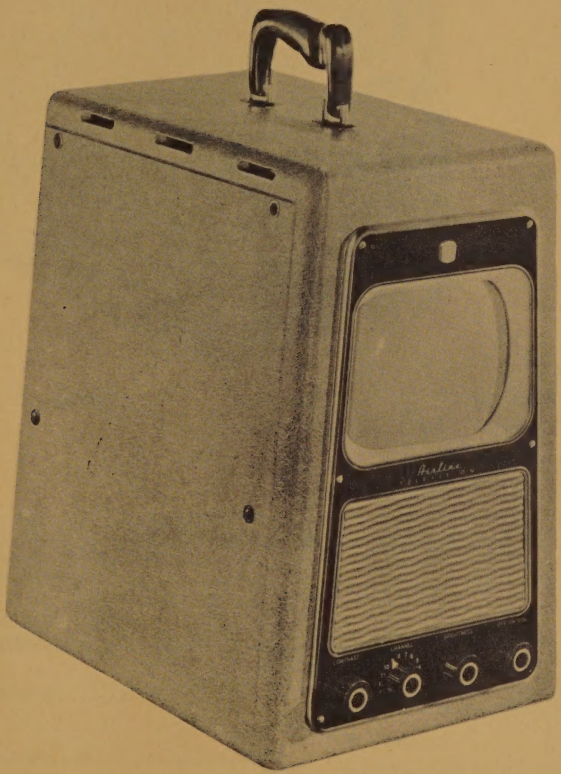

AIRLINE MODEL
84GSE3011A

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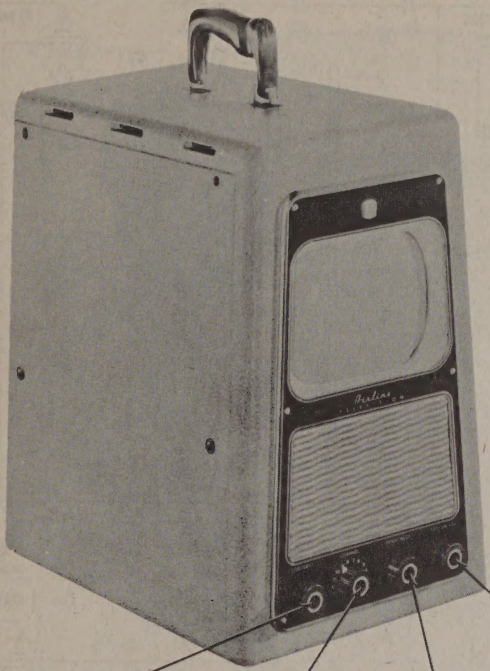
Date 1/50 Set No. 82—Folder No. 1

PHOTOFACT* Folder
*TRADE MARK

AIRLINE MODEL 84GSE3011A



AIRLINE MODEL 84GSE3011A

TRADE NAME	Airline Model 84GSE3011A
MANUFACTURER	Montgomery Ward and Co., 619 Chicago Ave., Chicago, Ill.
TYPE SET	Portable TV Receiver
TUBES	Twenty-One
POWER SUPPLY	110-120 Volts AC
TUNING RANGE—BROADCAST	RATING: 1.18 Amp. @ 117 Volts AC

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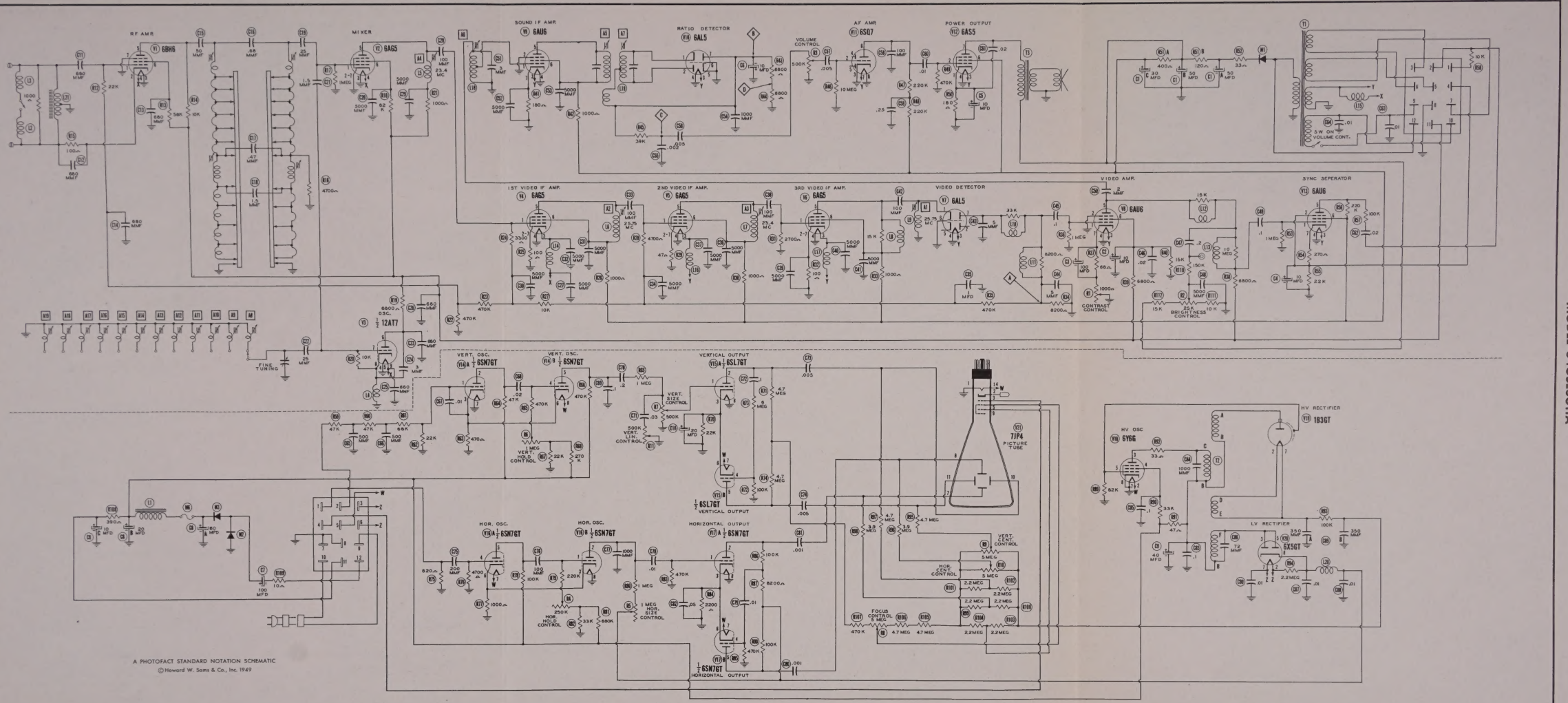
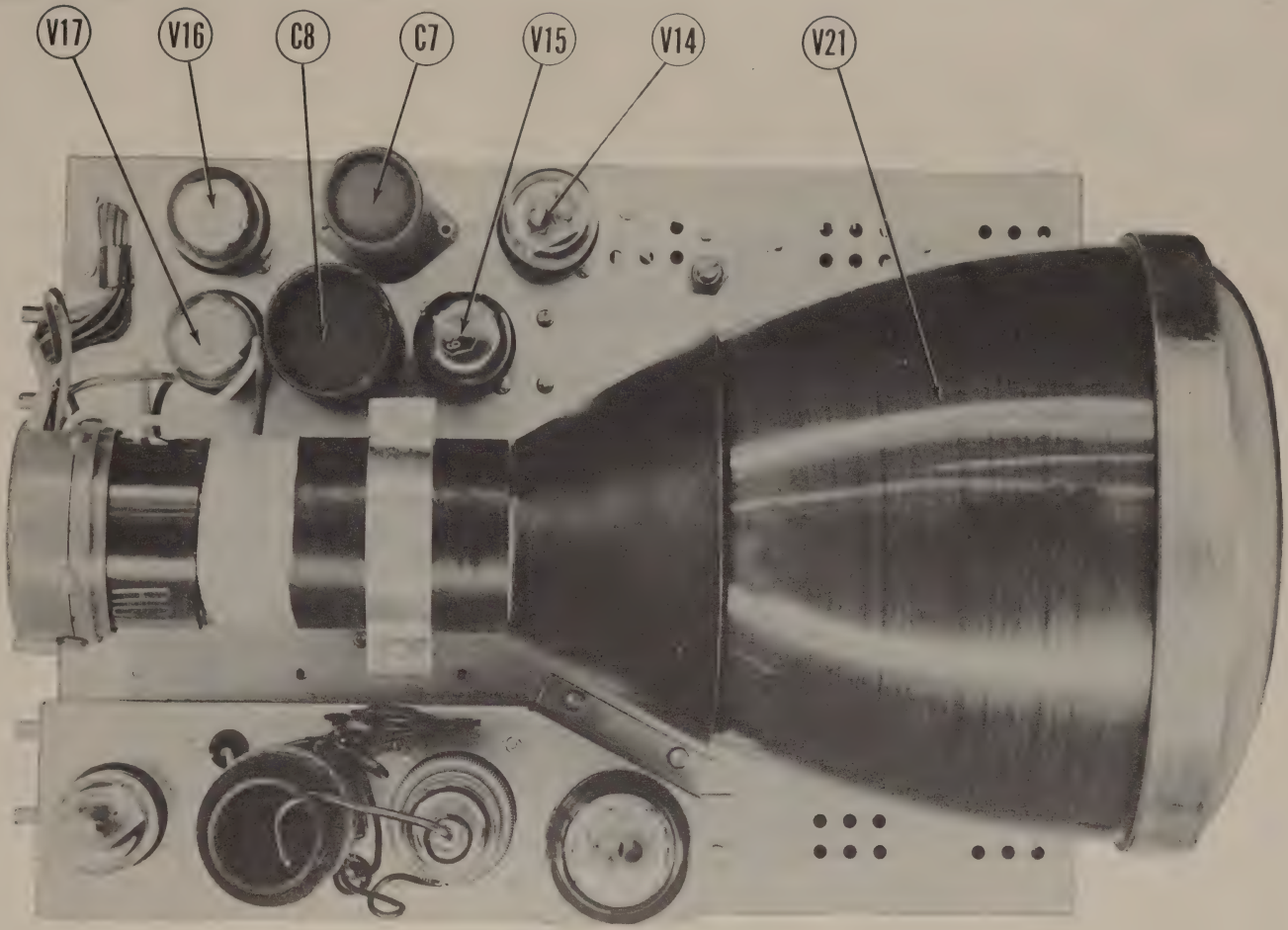
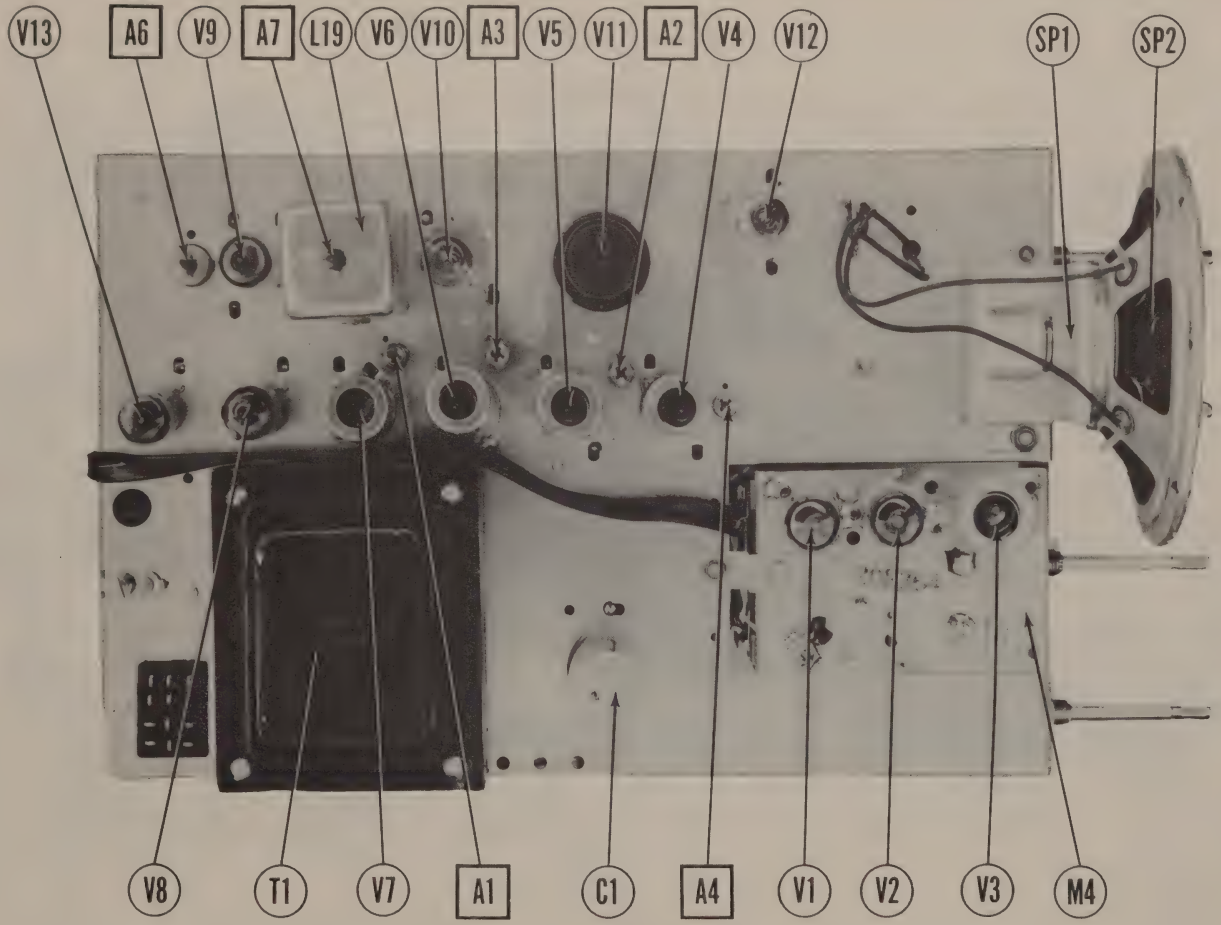


AIRLINE
MODEL 84GSE3011A



SWEEP CHASSIS-TOP VIEW



RF-IF CHASSIS-TOP VIEW

ALIGNMENT INSTRUCTIONS

VIDEO IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Remove the local oscillator tube V3 to prevent erroneous indications.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.		High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	25.75MC (Unmod.)	Any	DC Probe to Point (A) Common to chassis.	A1,A2	Adjust for maximum deflection.
2.		"	23.4MC (Unmod.)	"	"	A3,A4	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
3.		High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	24MC (10MC Sweep)	25.75MC 23.4MC	Any	Vert. Amp. to Point A. Low side to chassis.		Check for response as per Fig 1, with markers as shown. If necessary, slightly retouch A1 thru A4 for proper response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
4.	.01MFD	High side to pin 5 (plate) of 6AU6 (V8). Low side to chassis.	4.5MC (Unmod.)	Any	DC Probe to Point (B) Common to chassis.	A5,A6	Adjust for maximum deflection.
5.	.01MFD	"	"	"	DC Probe to Point (C) Common to Point (D)	A7	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60\ modulation and 450KC sweep. Use 120\ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	.01MFD	High side to pin 1 (Grid) of 6AU6 (V8). Low side to chassis.	4.5MC (450KC Sweep)	4.5MC	Any	Vert. Amp. to Point (B) Low side to chassis.	A5,A6	Disconnect stabilizer capacitor C6. Adjust A5 and A6 for maximum amplitude as per Fig 2.
5.	.01MFD	"	"	"	"	Vert. Amp. to Point (D) Low side to chassis.	A7,A5	Reconnect stabilizer capacitor C6. Adjust A7 so 4.5MC marker occurs at center of crossover lines as per Fig 3. Slightly retouch A5 for maximum amplitude and straightness of crossover lines.

OSCILLATOR ALIGNMENT

Replace local oscillator tube V3.
The RF and mixer lines are pre-tuned at the factory, and because they are sufficiently broad do not require adjustment in the field.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Two 150Ω carbon res.	Across antenna terminals with 150Ω in each lead.	213MC (10MC Sweep)	211.25MC 215.75MC	13	Vert. Amp. to Point (A) Low side to chassis.	A8	Check for correct response with marker placement as per Fig 4. It should be noted that each channel's oscillator circuit is individually tuned and only those channels requiring alignment need be adjusted.
			207MC (10MC Sweep)	205.25MC 209.75MC	12		A9	
			201MC (10MC Sweep)	199.25MC 203.75MC	11		A10	
			195MC (10MC Sweep)	193.25MC 197.75MC	10		A11	
			189MC (10MC Sweep)	187.25MC 191.75MC	9		A12	
			183MC (10MC Sweep)	181.25MC 185.75MC	8		A13	
			177MC (10MC Sweep)	175.25MC 179.75MC	7		A14	
			85MC (10MC Sweep)	83.25MC 87.75MC	6		A15	
			79MC (10MC Sweep)	77.25MC 81.75MC	5		A16	
			69MC (10MC Sweep)	67.25MC 71.75MC	4		A17	
			63MC (10MC Sweep)	61.25MC 65.75MC	3		A18	
			57MC (10MC Sweep)	55.25MC 59.75MC	2		A19	

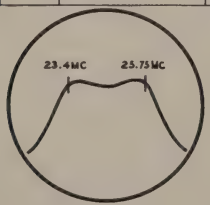


FIG. 1

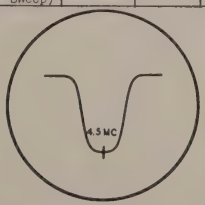


FIG. 2

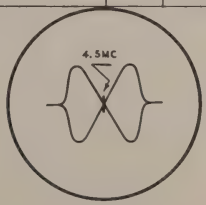


FIG. 3

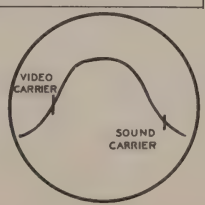
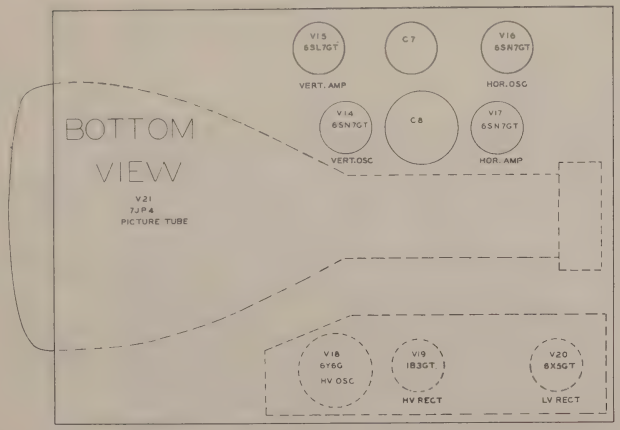
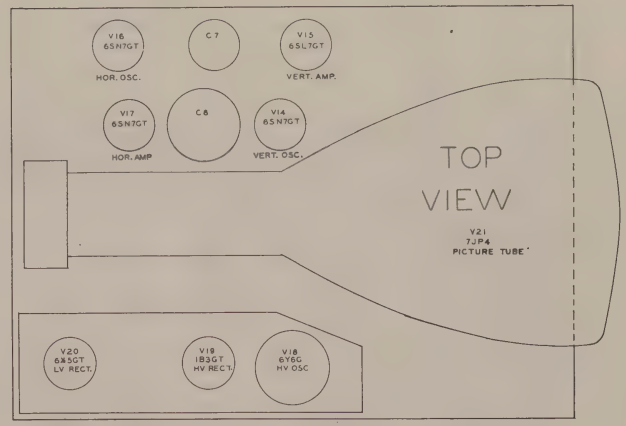
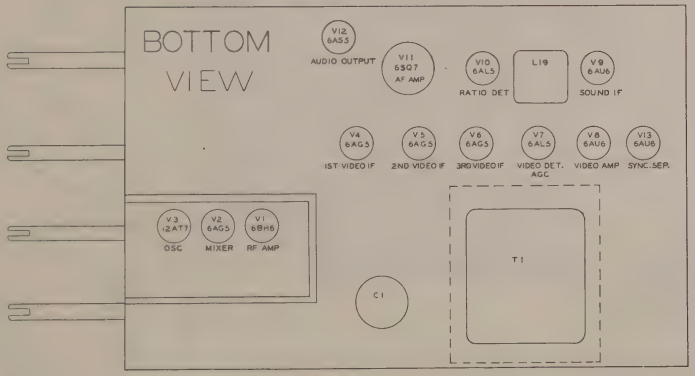
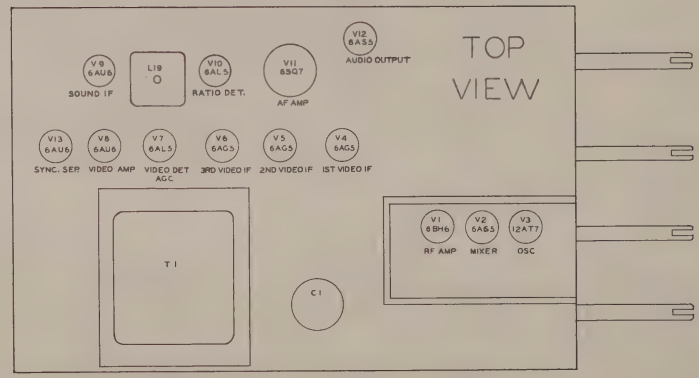


FIG. 4









TUBE PLACEMENT CHART

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BH6	-.1VDC	0V	0V	6.3VAC	240VDC	240VDC	0V		
V 2	6AG5	-1.8VDC	0V	0V	6.3VAC	240VDC	135VDC	0V		
V 3	12AT7	0V	0V	0V	0V	0V	180VDC	§-.4VDC	0V	6.3VAC
V 4	6AG5	-.3VDC	.5VDC	6.3VAC	0V	110VDC	110VDC	.5VDC		
V 5	6AG5	-.3VDC	.3VDC	6.3VAC	0V	110VDC	110VDC	.3VDC		
V 6	6AG5	0V	.8VDC	6.3VAC	0V	110VDC	110VDC	.8VDC		
V 7	6AL5	0V	0V	6.3VAC	0V	0V	0V	-.2VDC		
V 8	6AU6	.5VDC	0V	6.3VAC	0V	180VDC	140VDC	12VDC		
V 9	6AU6	0V	0V	6.3VAC	0V	110VDC	110VDC	1.1VDC		
V 10	6AL5	-.2VDC	-.1VDC	6.3VAC	0V	0V	0V	.3VDC		
V 11	6SQ7	0V	-.4VDC	0V	0V	0V	57VDC	6.3VAC	0V	
V 12	6AS5	7.3VDC	0V	6.3VAC	0V	0V	115VDC	117VDC		
V 13	6AU6	0V	3.6VDC	6.3VAC	0V	85VDC	117VDC	3.6VAC		
V 14	6SN7GT	0V	80VDC	2VDC	-2.4VDC -4.6VDC	35VDC	2VDC	0V	6.3VAC	
V 15	6SL7GT	0V 0V	*	2.1VDC	0V	90VDC	2.1VDC	6.3VAC	0V	
V 16	6SN7GT	-1.8VDC -2.2VDC	28VDC 50VDC	2.9VDC	0V	75VDC	2.9VDC	6.3VAC	0V	
V 17	6SN7GT	0V	300VDC	16VDC	0V	345VDC	16VDC	6.3VAC	0V	
V 18	6Y6G	240VDC	6.3VAC	240VDC	135VDC	-6.1VDC	240VDC	0V	0V	
V 19	1B3GT	* DO NOT MEASURE								
V 20	6X5GT	0V	680VDC	260VDC	0V	260VDC	0V	680VDC	750VDC	

	PINS	1	2	3	5	7	8	9	10	11	14
V21	7JP4	0V	162VDC	3.6VDC	*	*	*	*	*	*	6.3VAC

§ Taken with vacuum tube voltmeter.
* Do not measure.

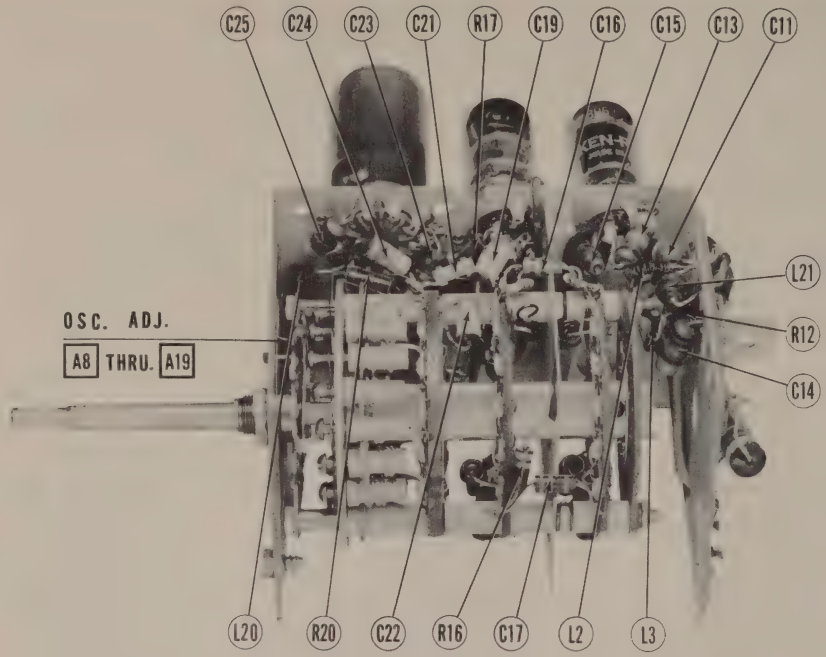
RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BH6	360KΩ	100Ω	0Ω	.1Ω	†10KΩ	†56KΩ	0Ω		
V 2	6AG5	1 Meg.	0Ω	0Ω	.1Ω	†1.5KΩ	†82KΩ	0Ω		
V 3	12AT7	0Ω	0Ω	0Ω	0Ω	0Ω	†7KΩ	10KΩ	0Ω	.1Ω
V 4	6AG5	360KΩ	100Ω	.1Ω	0Ω	♣1.5KΩ	♣1.5KΩ	100Ω		
V 5	6AG5	360KΩ	47Ω	.1Ω	0Ω	♣1.5KΩ	♣1.5KΩ	47Ω		
V 6	6AG5	2.7KΩ	100Ω	.1Ω	0Ω	♣1.5KΩ	♣1.5KΩ	100Ω		
V 7	6AL5	.1Ω	8KΩ	.1Ω	0Ω	Inf.	0Ω	8KΩ		
V 8	6AU6	1 Meg.	0Ω	.1Ω	0Ω	†7.5KΩ	†6.5KΩ	1000Ω		
V 9	6AU6	1Ω	0Ω	.1Ω	0Ω	♣1.5KΩ	♣1.5KΩ	180Ω		
V 10	6AL5	Inf.	Inf.	.1Ω	0Ω	0Ω	0Ω	13.5KΩ		
V 11	6SQ7	0Ω	10 Meg.	0Ω	Inf.	Inf.	♣440KΩ	.1Ω	0Ω	
V 12	6AS5	180Ω	470KΩ	.1Ω	0Ω	470KΩ	♣520Ω	♣400Ω		
V 13	6AU6	1 Meg.	22KΩ	.1Ω	0Ω	♣220KΩ	♣520Ω	22KΩ		
V 14	6SN7GT	22KΩ	†47KΩ	470Ω	1.5Meg. 500KΩ	†470KΩ	470Ω	0Ω	.1Ω	
V 15	6SL7GT	500KΩ 18Ω	Inf.	22KΩ	100KΩ	Inf.	22KΩ	.1Ω	0Ω	
V 16	6SN7GT	500KΩ 250KΩ	♦2 Meg. ♦1 Meg.	1000Ω	4.7KΩ	†100KΩ	1000Ω	.1Ω	0Ω	
V 17	6SN7GT	470KΩ	♦110KΩ	2.2KΩ	470KΩ	♦100KΩ	2.2KΩ	.1Ω	0Ω	
V 18	6Y6G	†180Ω	.1Ω	†200Ω	†33KΩ	82KΩ	†140Ω	0Ω	0Ω	
V 19	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP †750Ω
V 20	6X5GT	Inf.	Inf.	†300Ω	Inf.	†300Ω	Inf.	Inf.	Inf.	

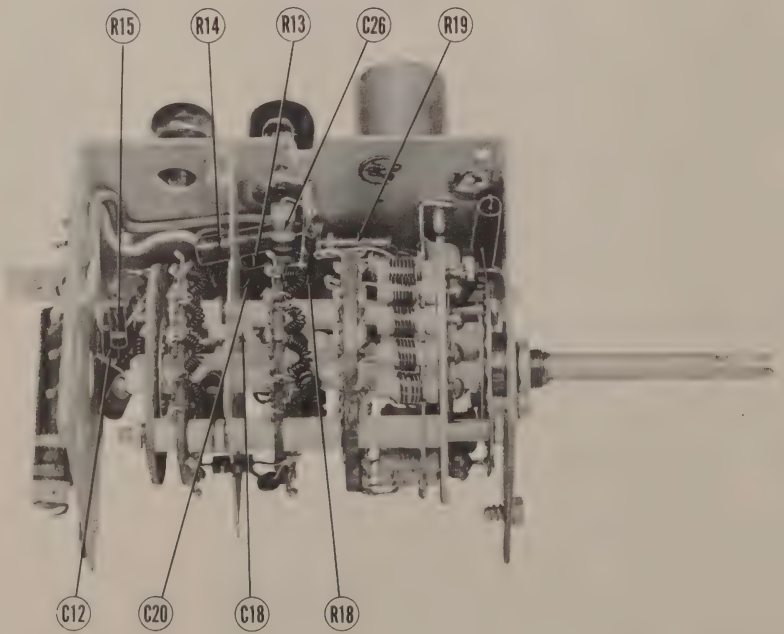
	PINS	1	2	3	5	7	8	9	10	11	14
V21	7JP4	0Ω	170KΩ	22KΩ	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	.1Ω

† Measured from output of M3.
♣ Measured from output of M1.
♦ Measured from pin 8 of V20.

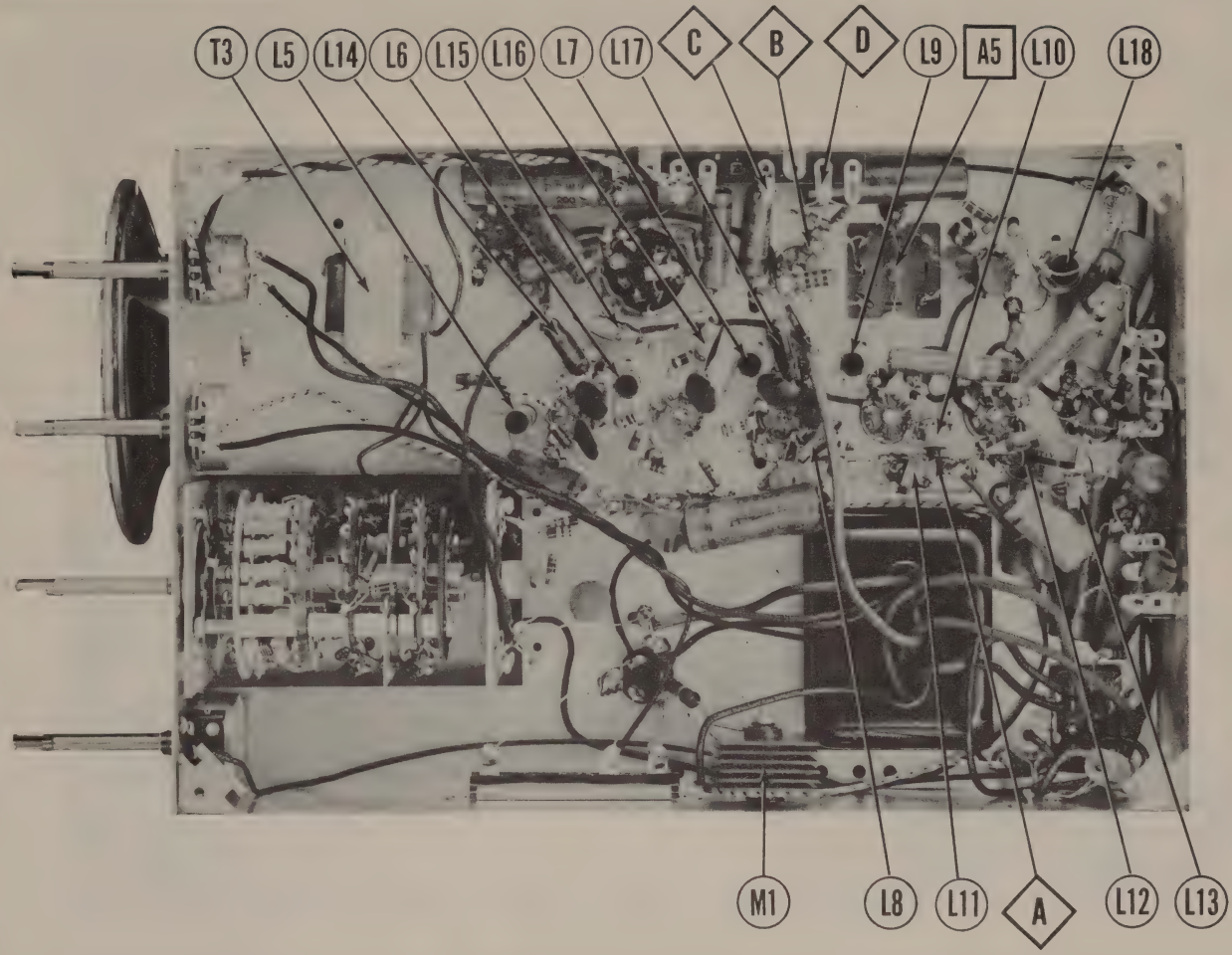
1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.



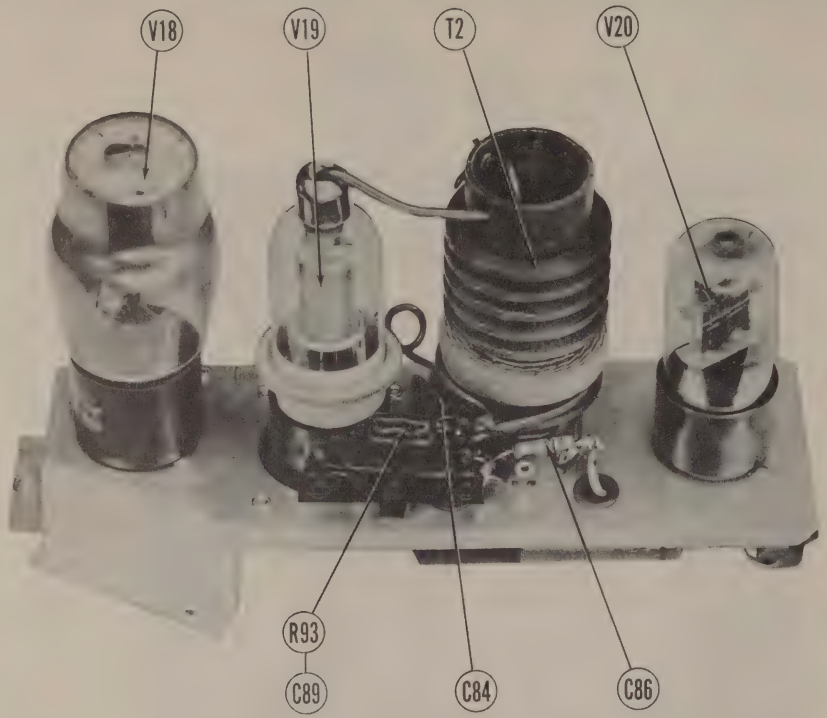
RF TUNER-RIGHT SIDE



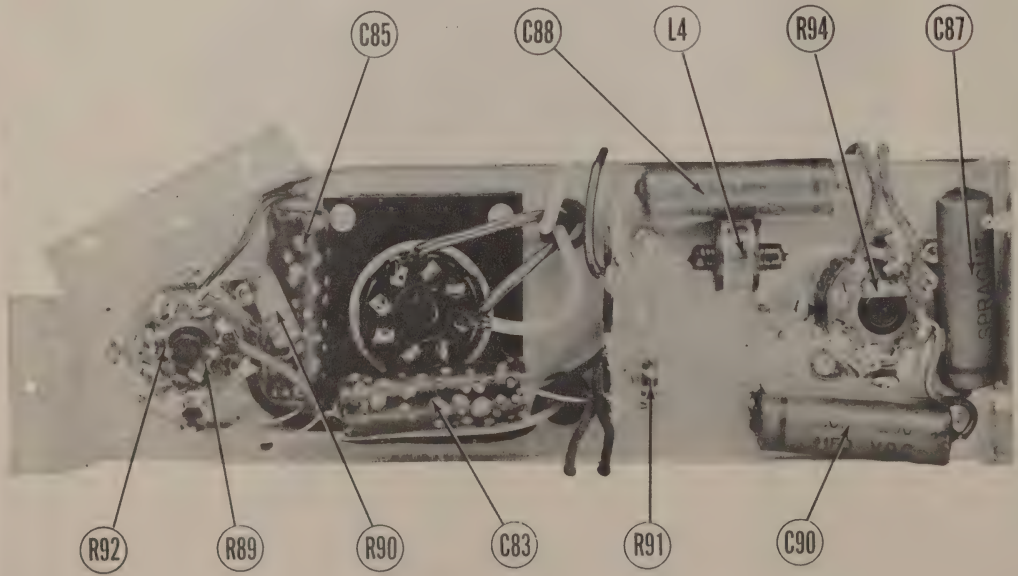
RF TUNER-LEFT SIDE



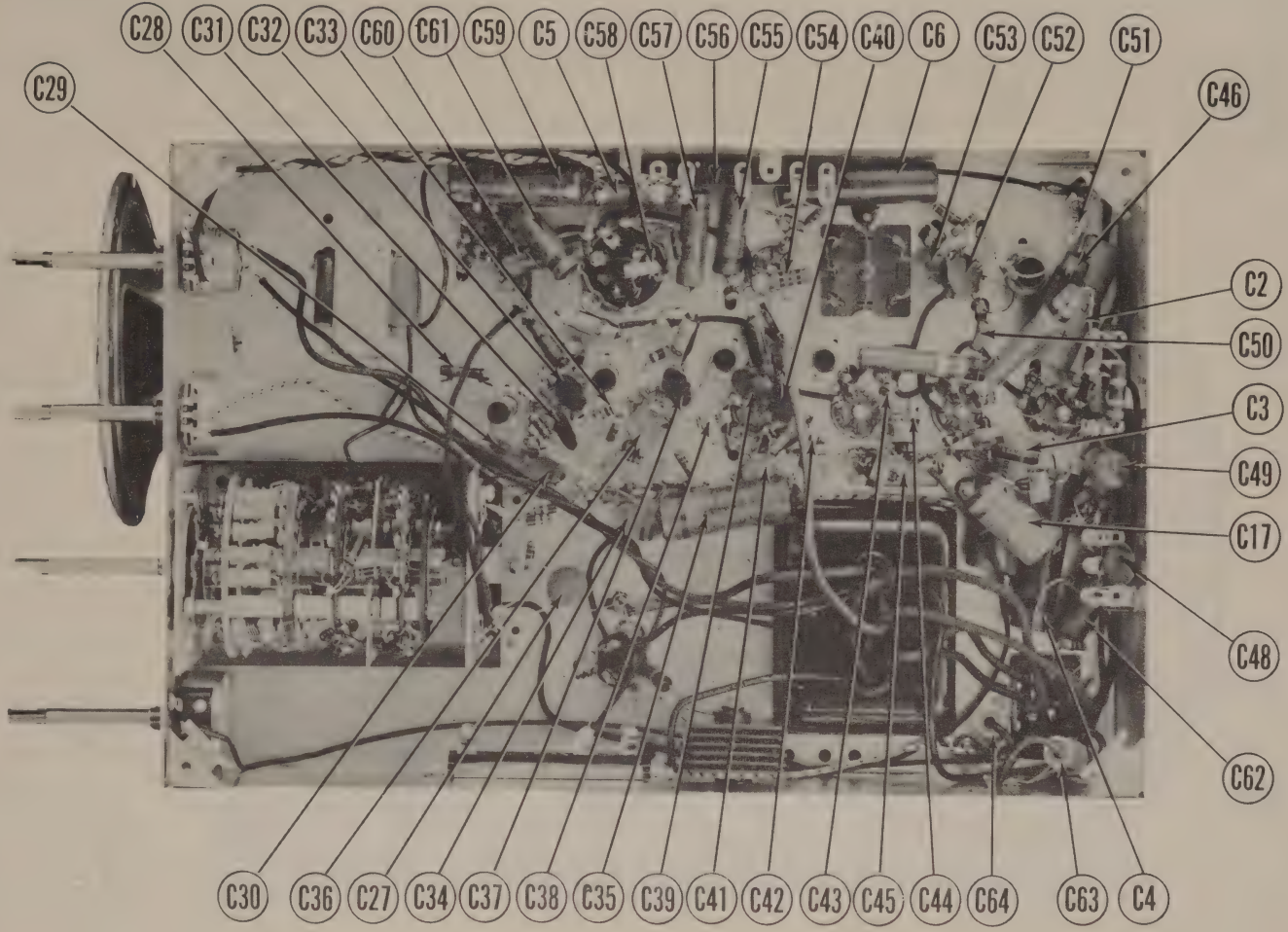
RF-IF CHASSIS-BOTTOM VIEW -TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION



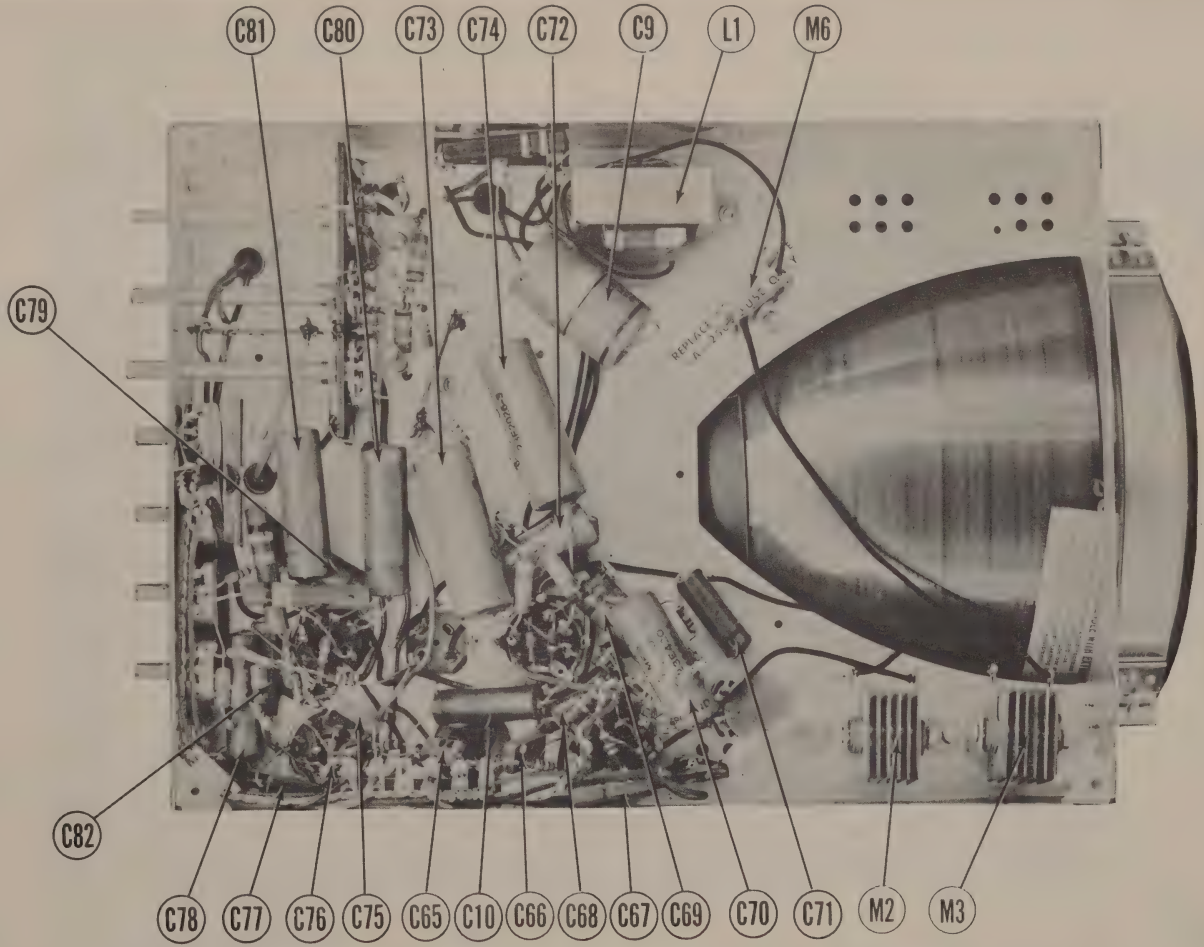
HIGH VOLTAGE SUPPLY - TOP VIEW



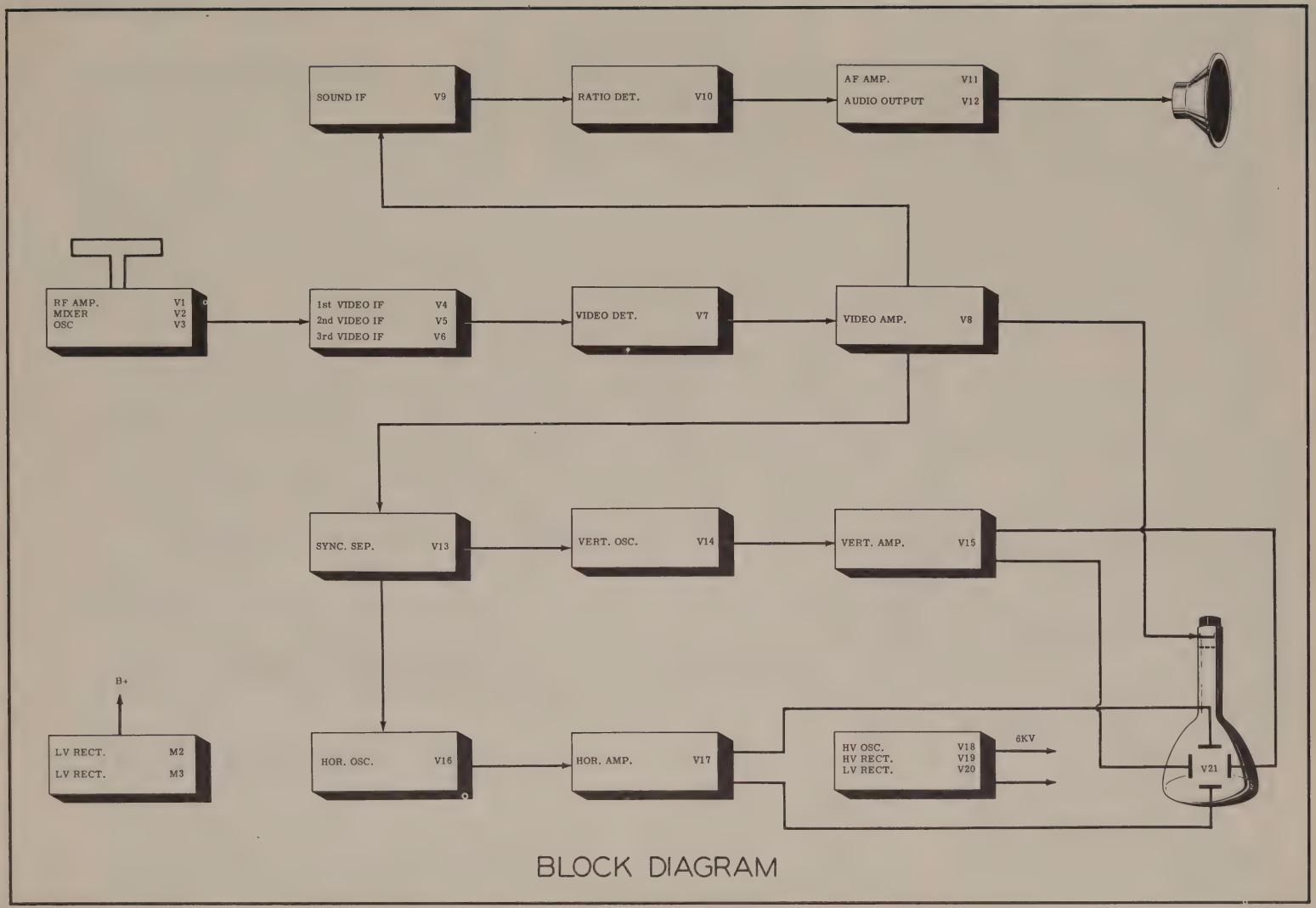
HIGH VOLTAGE SUPPLY - BOTTOM VIEW



RF-IF CHASSIS-BOTTOM VIEW-CAPACITOR IDENTIFICATION



SWEEP CHASSIS-BOTTOM VIEW-CAPACITOR IDENTIFICATION



BLOCK DIAGRAM

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: AIRLINE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6BH6	6BH6	7CM	
V2	Mixer	6AG5	6AG5	7BD	
V3	Oscillator	12AT7	12AT7	9A	
V4	1st Video IF Amp.	6AG5	6AG5	7BD	
V5	2nd Video IF Amp.	6AG5	6AG5	7BD	
V6	3rd Video IF Amp.	6AG5	6AG5	7BD	
V7	Video Detector	6AL5	6AL5	6BT	
V8	Video Amp.	6AU6	6AU6	7BK	
V9	Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Detector	6AL5	6AL5	6BT	
V11	AF Amp.	6SQ7	6SQ7	8Q	
V12	Audio Output	6AS5	6AS5	7CV	
V13	Sync. Sep.	6AU6	6AU6	7BK	
V14	Vert. Osc.	6SN7GT	6SN7GT	8BD	
V15	Vert. Amp.	6SL7GT	6SL7GT	8BD	
V16	Hor. Osc.	6SN7GT	6SN7GT	8BD	
V17	Hor. Amp.	6SN7GT	6SN7GT	8BD	
V18	HV Osc.	6Y6G	6Y6G	7AC	
V19	HV Rectifier	1B3GT	1B3GT	3C	
V20	LV Rectifier	6X5GT	6X5GT	6S	
V21	Picture Tube	7JP4	7JP4	14G	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: AIRLINE PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	50	150	25E30	AF888D	UP44415		D12112	■ Filter
B	50	150						▲ Filter
C	30	150						Filter
C2	10	250	25E35	PRS250/12	BR1225		UT-32	Video Amp. Screen Bypass
C3	100	10	25E12	PRS12/100	BRH121		18D8	Video Amp. Cath. Bypass
C4	10	25	25E8	PRS25/10	BBR-10-25T		TVA-5	Sync. Sep. Cath. Bypass
C5	10	25	25E8	PRS25/10	BBR10-25T		TVA-5	Output Cath. Bypass
C6	10	25	25E8	PRS25/10	BBR10-25T		TVA-5	Stabilizing Cap.
C7	100	150	25E32	AF20D	UP6AJ333			Voltage Doubler Cap.
C8A	60	300	25E33	AFH12420	UP9CJ180			▲ Filter
B	20	300						■ Filter
C	10	300						▲ Filter
C9	40	300	25E31	PRS450/40	BR4035		UT-40	Decoupling
C10	20	25	25E3	PRS25/25	BBR20-25		TVA-6	Vert. Amp. Cath. Bypass
C11	680					GP2K-680		RF Coupling
C12	680					GP2K-680		RF Cath. Bypass
C13	680					GP2K-680		RF Screen Bypass
C14	680					GP2K-680		AGC Filter
C15	50					GP1K-50		RF Coupling
C16	.68							" "
C17	.47							" "
C18	1.5					NPOK-1.5		" "
C19	25					GP1K-25		" "
C20	5000					811-005		Mixer Screen Bypass
C21	1.5					NPOK-1.5		Osc. Coupling
C22	25					GP1K-25		Osc. Grid Cap.
C23	680					GP2K-680		Osc. Plate Bypass
C24	3					NPOK-3		Osc. Feedback
C25	680					GP2K-680		Osc. Fil. Bypass
C26	680					GP2K-680		RF Bypass
C27	5000		23E2025	1467-005	1D5D5	811-005	29C1	Filament Bypass
C28	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C29	5000		23E2025	1467-005	1D5D5	811-005	29C1	Mixer Plate Dec.
C30	5000		23E2025	1467-005	1D5D5	811-005	29C1	AGC Filter
C31	5000		23E2025	1467-005	1D5D5	811-005	29C1	1st V. IF Dec.
C32	5000		23E2025	1467-005	1D5D5	811-005	29C1	1st V. IF Fil. Bypass
C33	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C34	5000		23E2025	1467-005	1D5D5	811-005	29C1	AGC Filter
C35	1.0	200	23E226	484-1.0	GT2W1		TC-10	" ‡
C36	5000		23E2025	1467-005	1D5D5	811-005	29C1	2nd V. IF Decoupling
C37	5000		23E2025	1467-005	1D5D5	811-005	29C1	2nd V. IF Fil. Bypass
C38	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C39	5000		23E2025	1467-005	1D5D5	811-005	29C1	3rd V. IF Cath. Bypass
C40	5000		23E2025	1467-005	1D5D5	811-005	29C1	3rd V. IF Fil. Bypass
C41	5000		23E2025	1467-005	1D5D5	811-005	29C1	3rd V. IF Decoupling
C42	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C43	5		23E28	1468-000005	5W5V5	NPOK-5	MS-55	V. Diode Filter
C44	5		23E28	1468-000005	5W5V5	NPOK-5	MS-55	V. Diode Filter
C45	.1	200	23E2014-9	P288-1	GT2P1		TM-1	Video Coupling
C46	.02	400	23E413	P488-02	GT4S2		TM-12	V. Amp. Screen Bypass
C47	.2	400	23E2014-22	P488-22	GT4P2		TC-2	Video Coupling
C48	5000		23E2025	1467-005	1D5D5	811-005	29C1	Pic. Tube Cath. Dec.
C49	.1	400	23E2014-23	P488-1	GT4P1		TM-1	Video Coupling
C50	2		23E21					S. IF Coupling
C51	3		23E13			NPOK-3		Fixed Trimmer
C52	5000		23E2025	1467-005	1D5D5	811-005	29C1	S. IF Cath. Bypass
C53	5000		23E2025	1467-005	1D5D5	811-005	29C1	S. IF Decoupling
C54	1000			1468-001	1W5D1	GP2L-001	1FM-21	Diode Load Cap.
C55	.002	400	23E405	P688-002	GT6D2	GP2M-002	TM-22	De-emphasis
C56	.005	400	23E408	P688-005	GT6D5	GP2M-005	TM-25	Audio Coupling
C57	.005	400	23E408	P688-005	GT6D5	GP2M-005	TM-25	" "
C58	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	AF Plate Bypass
C59	.25	200	23E222	P488-25	GT2P25		TC-2	AF Plate Decoupling
C60	.01	400	23E411	P488-01	GT2S1	GP2-335-01	TM-11	Audio Coupling
C61	.02	400	23E413	P488-02	GT4S2		TM-12	Output Plate Bypass
C62	.05	400	23E216	P488-05	GT4S5		TM-15	Sync. Coupling
C63	.01	220 VAC	23E250	P688-01	GT6S1		TM-11	Line Filter
C64	.01	220 VAC	23E250	P688-01	GT6S1		TM-11	" "

CAPACITO

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: AIRLINE PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNE DUBILIE PART N
C65	500	500	23E45	1468-0005	5W5T5
C66	500	500	23E45	1468-0005	5W5T5
C67	.01	400	23E211	P488-01	GT4S1
C68	.02	400	23E2014-19	P488-02	GT4S2
C69	.1	400	23E2014-9	P488-1	GT4P1
C70	.2	400	23E421	P488-22	GT4P2
C71	.03	400		P488-03	GT4S3
C72	.1	600	23E618	P688-1	GT4P1
C73	.005	6000	23E2026-3	7584-005	DSTH-60D
C74	.005	6000	23E2026-3	7584-005	DSTH-60D
C75	200	500	23E41	1468-0002	5W5T2
C76	100		23E11	1468-0001	5W5T1
C77	1000	500	23E50-10	1468-001	1W5D1
C78	.01	1200	23E1211	P1688-01	GT16S1
C79	.01	1200	23E1211	P1688-01	GT16S1
C80	.001	6000	23E2026-2	7584-001	DSTH-60D
C81	.001	6000	23E2026-2	7584-001	DSTH-60D
C82	.05	200	23E216	P288-05	GT2S5
C83	.1	400	23E418	P488-1	GT4P1
C84	1000	500	23E50-10	1468-001	1W5D1
C85	.1	400	23E418	P488-1	GT4P1
C86	72		23E29	1468-000075	5W5Q7
C87	.01	1200	23E1211	P1688-01	GT16S1
C88	.01	1200	23E1211	P1688-01	GT16S1
C89A	350		*		
B	350				
C90	.01	1200	23E1211	P1688-01	GT16S1

* Items C89A, C89B, and R93 are combined in 23E2022-3.
† Some models use 5000MFF in this applicati
‡ Some models use .25MFD in this applicatio

CON

ITEM No.	RATING: RESIST-ANCE	RATING: WATTS	REPLACEMENT DATA: AIRLINE PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLARC PART
R1	1000Ω	2	28E31		58-100
R2A	25KΩ	½	28E32	Q11-120	AM-40-
B	Shaft	½	Not Req.	Not Req.	KSS-3
R3A	500KΩ	½	28E33	Q13-133	AM-60-
B	Shaft		Not Req.	Not Req.	KSS-3
C	Switch		Not Req.	76-1	SW-A
R4	250KΩ	½	28E45	Q11-130	15/16-
R5	1 Meg.	½	28E36	Q11-137	15/16-
R6	1 Meg.	½	28E36	Q11-137	15/16-
R7	500KΩ	½	28E37	Q11-133	15/16-
R8	5 Meg.	½	28E34	Q11-141 & C-3 #	
R9	5 Meg.	½	28E34	Q11-141 & C-3#	
R10	5 Meg.	½	28E34	Q11-141 & C-3 #	
R11	500KΩ	½	28E37	Q11-133	M-58-5

Use an extra nut as a spacer to hold contr
Then saw off shaft of new control so that
original shaft, (insulated shaft) to the n
has plenty of clearance between itself and

RES

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: AIRLINE PART No.	REPLACEMENT DATA: IRC PART No.
R12	22KΩ 20%	½		
R13	56KΩ 20%	½		
R14	10KΩ	1		
R15	100Ω	½		
R16	4700Ω	½		
R17	1 Meg.	½		
R18	82KΩ	½		
R19	6800Ω	½		
R20	10KΩ 20%	½		
R21	1000Ω	½	27E102	BTS-1000
R22	470KΩ 20%	½	27E474	BTS-470K
R23	470KΩ 20%	½	27E474	BTS-470K
R24	3300Ω	½	27E332	
R25	100Ω	½	27E101	
R26	1000Ω	½	27E102	BTS-1000
R27	10KΩ	½	27E103	BTS-10K
R28	4700Ω 20%	½	27E472	BTS-4700
R29	47Ω	½	27E470	
R30	1000Ω	½	27E102	BTS-1000
R31	2700Ω	½	27E272	
R32	100Ω	½	27E101	
R33	1000Ω	½	27E102	BTS-1000
R34	8200Ω	½	27E822	BTS-8200
R35	470KΩ 20%	½	27E474	BTS-470K
R36	1 Meg.20%	½	27E105	BTS-1 Meg.
R37	68Ω	½	27E680	
R38	6800Ω	1	27E682-3	BTA-6800
R39	6800Ω	2	27E682-5	BT-2-6800
R40	15KΩ	2	27E153-5	BT-2-15K
R41	180Ω	½	27E181	
R42	1000Ω	½	27E102	BTS-1000
R43	6800Ω	½	27E682	BTS-6800
R44	6800Ω	½	27E682	BTS-6800
R45	39KΩ	½	27E393	BTS-39K
R46	10Meg.20%	½	27E106	BTS-10 Meg
R47	220KΩ 20%	½	27E224	BTS-220K
R48	220KΩ 20%	½	27E224	BTS-220K

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6AK5	6AK	
V2	Mixer	6BE6	6BD	
V3	Oscillator	12AT7	9AQ	
V4	1st Video IF Amp.	6AK5	6BD	
V5	2nd Video IF Amp.	6AK5	6BD	
V6	3rd Video IF Amp.	6AK5	6BD	
V7	Video Detector	6AL5	6AT	
V8	Video Amp.	6AU6	6AU	
V9	Sound IF Amp.	6AU6	6AU	
V10	Ratio Detector	6AL5	6AT	
V11	AF Amp.	6AU6	6AU	
V12	Audio Output	6K6GT	6AQ	
V13	Sync. Sep.	6AU6	6AU	
V14	Vert. Osc.	6SN7GT	9AU	
V15	Vert. Amp.	6SN7GT	9AU	
V16	Hor. Osc.	6SN7GT	9AU	
V17	Hor. Amp.	6BQ5	6CU	
V18	HV Osc.	6AU6	6AU	
V19	HV Rectifier	6AL5	6AT	
V20	LV Rectifier	6AL5	6AT	
V21	Picture Tube	21AXP22		

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: AIRLINE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	50	150	25E30	AF888D	UP44415			■ Filter
B	50	150						▲ Filter
C	50	150						Filter
C2	10	250	25E35	PRS250/12	BR1225		UT-82	Video Amp. Screen Bypass
C3	10	12	25E28	PRS12/100	BR0121		1UB8	Video Amp. Cath. Bypass
C4	10	25	25E8	PR825/10	BBR-10-25T		TVA-5	Sync. Sep. Cath. Bypass
C5	10	25	25E8	PR825/10	BBR10-25T		TVA-5	Output Cath. Bypass
C6	10	25	25E8	PR825/10	BBR10-2-25T		TVA-5	Stabilizing Cap.
C7	100	150	25E32	AP20D	UP6A2553			Voltage Doubler Cap.
C8A	160	300	25E33	APR1282D	UP5G2150			■ Filter
B	20	300						▲ Filter
C	10	300						Filter
C9	40	300	25E31	PRS450/40	BR4035		UT-40	Decoupling
C10	20	25	25E3	PR825/25	BBR20-25		TVA-6	Vert. Amp. Cath. Bypass
C11	680					GP5K-680		RF Coupling
C12	680					GP2K-680		RF Cath. Bypass
C13	680					GP5K-680		RF Screen Bypass
C14	680					GP5K-680		AGC Filter
C15						GP1K-50		RF Coupling
C16	1.68							" "
C17	1.47							" "
C18	11.5					NP0K-1.5		" "
C19	25					GP1K-25		" "
C20	5000					811-005		Mixer Screen Bypass
C21	11.5					NP0K-1.5		Osc. Coupling
C22	25					GP1K-25		Osc. Grid Cap.
C23						GP2K-680		Osc. Plate Bypass
C24						NP0K-5		Osc. Feedback
C25	680					GP2K-680		Osc. Fil. Bypass
C26	680					GP2K-680		RF Bypass
C27	5000		23E2025	1467-005	1D5D5	811-005	2GC1	Filament Bypass
C28	100		23E11	1469-0001	5W5T1	GP1K-100	1TM-31	IF Coupling
C29	5000		23E2025	1467-005	1D5D5	811-005	2GC1	Mixer Plate Dec.
C30	5000		23E2025	1467-005	1D5D5	811-005	2GC1	AGC Filter
C31	5000		23E2025	1467-005	1D5D5	811-005	2GC1	1st V. IF Dec.
C32	5000		23E2025	1467-005	1D5D5	811-005	2GC1	1st V. IF Fil. Bypass
C33	100		23E11	1468-0001	5W5T1	GP1K-100	1TM-31	IF Coupling
C34	5000		23E2025	1467-005	1D5D5	811-005	2GC1	AGC Filter
C35	1.0	200	23E2026	484-1.0	7C5-1	"	"	" "
C36	5000		23E2025	1467-005	1D5D5	811-005	2GC1	2nd V. IF Decoupling
C37	5000		23E2025	1467-005	1D5D5	811-005	2GC1	2nd V. IF Fil. Bypass
C38	100		23E11	1469-0001	5W5T1	GP1K-100	1TM-31	IF Coupling
C39	5000		23E2025	1467-005	1D5D5	811-005	2GC1	3rd V. IF Cath. Bypass
C40	5000		23E2025	1467-005	1D5D5	811-005	2GC1	3rd V. IF Fil. Bypass
C41	5000		23E2025	1467-005	1D5D5	811-005	2GC1	3rd V. IF Decoupling
C42	100		23E11	1468-0001	5W5T1	GP1K-100	1TM-31	IF Coupling
C43	5		23E28	1469-000005	4N7P5	NP0K-5	NP-5	V. Diode Filter
C44	5		23E28	1469-000005	4N7P5	NP0K-5	NP-5	V. Diode Filter
C45	.1	200	23E2014-9	P288-1			TP-1	Video Coupling
C46	12	400	23E418	P488-02			TP-12	V. Amp. Screen Bypass
C47	1.2	400	23E2014-22	P638-22			TP-1.2	Video Coupling
C48	5000		23E2025	1467-005	1D5D5	811-005	2GC1	Pic. Tube Cath. Dec.
C49	.1	400	23E2014-23	P488-1			TP-1	Video Coupling
C50	2		23E21					S. IF Coupling
C51	1		23E13			NP0K-3		Fixed Trimmer
C52	5000		23E2025	1467-005	1D5D5	811-005	2GC1	S. IF Cath. Bypass
C53	5000		23E2025	1467-005	1D5D5	811-005	2GC1	S. IF Decoupling
C54	1000			1468-001	1W5D1	GP2K-001	1TM-21	Diode Load Cap.
C55	.002	400	23E405	P638-002	7T5S2	GP2K-002	TP-.002	De-emphasis
C56	.005	400	23E408	P638-005	7T5S5	GP2K-005	TP-.005	Audio Coupling
C57	.005	400	23E408	P638-005	7T5S5	GP2K-005	TP-.005	" "
C58	100		23E11	1468-0001	5W5T1	GP1K-100	1TM-31	AF Plate Bypass
C59	.25	200	23E222	P488-25	7T2P25		TP-.25	AF Plate Decoupling
C60	.01	400	23E411	P488-01	7T2S1	GP2-335-01	TP-.01	Audio Coupling
C61	.02	400	23E413	P488-02	7T4S2		TP-.02	Output Plate Bypass
C62	.05	400	23E216	P488-05	7T4S5		TP-.05	Sync. Coupling
C63	.01	220 VAC	23E250	P688-01	7T6S1		TM-11	Line Filter
C64	.01	220 VAC	23E250	P638-01	7T6S1		TM-11	" "

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: AIRLINE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C65	500	500	23E45	1468-0005	5W5T5	GP2K-500	1TM-35	Integrator Net.
C66	500	500	23E45	1468-0005	5W5T5	GP2K-500	1TM-35	" "
C67	.001	400	23E111	P488-01	GT4S1		TM-11	Filter (Wire Wound)
C68	.02	400	23E2014-19	P488-02	GT4S2		TM-12	Vert. MV Feedback
C69	.1	400	23E2014-9	P488-1	GT4P1		TM-1	Vert. Discharge
C70	.25	400	23E421	P488-22	GT4P25		TC-.5	Vert. Sweep Coupling
C71	.039	400		P488-03	GT4S3		TM-13	Linearity Comp.
C72	.1	600	23E618	P688-1	GT4T1		TM-1	Vert. Sweep Coupling
C73	.005	6000	23E2026-3	7584-005	DST5-6OD5		TVH-256	" "
C74	.005	6000	23E2026-3	7584-005	DST5-6OD5		TVH-256	" "
C75	200	500	23E41	1468-0002	5W5T2	GP2K-200	1TM-32	Hor. Sync. Coupling †
C76	100		23E11	1468-0001	5W5T1	GP1K-100	1TM-31	Hor. MV Feedback
C77	10000	500	23E50-10	1468-001	1W5D1	GP2L-001	1TM-21	Hor. Discharge
C78	.1	1200	23E421	P1688-01	GT16S1		TM-11	Hor. Sweep Coupling
C79	.1	1200	23E1211	P1688-01	GT16S1		TM-11	" " "
C80	.001	6000	23E2026-2	7584-001	DST5-6OD1		TVH-216	" " "
C81	.001	6000	23E2026-2	7584-001	DST5-6OD1			" " "
C82	.05	200	23E216	P288-05	GT2S5		TM-15	Hor. Output Cath. Bypass
C83	.1	400	23E419	P488-1	GT4P1		TM-1	Decoupling
C84	1000	1000	23E50-10	140-1-001	1WC01	GP2L-001	1TM-21	Fixed Trimmer
C85	.1	400	23E411	P488-1	GT4P1		TM-1	HV Osc. Screen Bypass
C86	.25		23E25	1468-000075	5W5Q7	N750L-75	2TM-475	Fixed Trimmer
C87	.1	1200	23E1211	P1688-01	GT16S1		TM-11	Med. HV Filter
C88	.1	1200	23E1211	P1688-01	GT16S1		TM-11	" "
C89A	.05	*						HV Filter
B	.25	*						" "
C90	.1	1200	23E1211	P1688-01	GT16S1		TM-11	Filament Bypass

* Items C89A, C89B, and R83 are combined into one unit, obtainable under HFGR'S Part No. 23E2022-3.

† Some models use 5000MMF in this application.

‡ Some models use .25MFD in this application.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: AIRLINE PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1	1000Ω	2	24E31	58-1000		Contrast control (Wire Wound)
R2A	2800	‡	24E32	Q11-1-20	AM-40-S	Brightness control
B	Shaft	‡	Not Req.	Not Req.	KBS-S	Attach to R2A per instructions
R3A	0.5MΩ	‡	24E33	Q13-1-33	AM-60-Z	Volume control
B	Shaft	‡	Not Req.	Not Req.	KSS-S	Attach to R3A per instructions
C	Switch	‡	Not Req.	76-1	SW-A	Attach to R3A per instructions
R4	250KΩ	‡	24E46	Q11-1-20	15/16-55-S	Horiz. hold control
R5	1 Meg.	‡	24E26	Q11-1-27	15/16-61-S	Horiz. size control
R6	1 Meg.	‡	24E26	Q11-1-37	15/16-61-S	Vert. hold control
R7	500KΩ	‡	24E27	Q11-1-33	15/16-58-S	Vert. size control
R8	5 Meg.	‡	24E34	Q11-141 & C-3 ‡		Focus control
R9	5 Meg.	‡	24E34	Q11-141 & C-3 ‡		Vert. centering control
R10	5 Meg.	‡	24E34	Q11-141 & C-3 ‡		Horiz. centering control
R11	500KΩ	½	24E27	Q11-133	M-58-8	Vert. linearity control

‡ Use an extra nut as a spacer to hold control back from control sub-panel as far as possible. Then saw off shaft of new control so that C-3 coupler can be employed to connect part of original shaft. (Insulated shaft) to the new control. (CAUTION; Be sure that C-3 coupler has plenty of clearance between itself and chassis.)

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: AIRLINE PART No.	IRC PART No.	IDENTIFICATION CODES ALL RESISTORS ARE ±10% UNLESS OTHERWISE STATED
R12	22KΩ 20%	‡			RF Grid
R13	56KΩ 20%	‡			RF Screen
R14	10KΩ	‡			RF Plate
R15	10Ω	‡			RF Cathode
R16	470Ω	‡			Mixer Coil Shunt
R17	1 Meg.	‡			Mixer Grid
R18	22KΩ	‡			Mixer Screen
R19	6800Ω	‡			Osc. Plate
R20	10KΩ 20%	‡	27E102	BTS-1000	Osc. Grid
R21	1000Ω	‡	27E102	BTS-1000	Mixer Plate Decoupling
R22	470KΩ 20%	‡	27E474	BTS-470K	Bias Network
R23	470KΩ 20%	‡	27E474	BTS-470K	" "
R24	3300Ω	‡	27E336		1st Video IF Grid
R25	10Ω	‡	27E101		1st Video IF Cathode
R26	1000Ω	‡	27E102	BTS-1000	1st Video IF Decoupling
R27	10KΩ	‡	27E103	BTS-10K	Bias Network
R28	470KΩ 20%	‡	27E472	BTS-4700	2nd Video IF Grid
R29	47Ω	‡	27E470		2nd Video IF Cathode
R30	1000Ω	‡	27E102	BTS-1000	2nd Video IF Decoupling
R31	2700Ω	‡	27E272		3rd Video IF Grid
R32	100Ω	‡	27E101		3rd Video IF Cathode
R33	1000Ω	‡	27E102	BTS-1000	3rd Video IF Decoupling
R34	220Ω	‡	27E222	BTS-6200	Video Det. Diode Load
R35	470KΩ 2%	‡	27E474	BTS-470K	Bias Network
R36	1 Meg. 20%	‡	27E105	BTS-1 Meg.	Video Amp. Grid
R37	75Ω	‡	27E630		Video Amp. Cathode
R38	6800Ω	‡	27E682-3	BTA-6800	Video Amp. Plate
R39	6800Ω	2	27E682-5	BT-2-6800	Video Amp. Screen
R40	15KΩ	2	27E153-5	BT-2-15K	Bleeder
R41	1KΩ	‡	27E181		Sound IF Cathode See Note 5
R42	1000Ω	‡	27E102	BTS-1000	Sound IF Decoupling
R43	6800Ω	‡	27E682	BTS-6800	Ratio Det. Diode Load
R44	1000Ω	‡	27E682	BTS-6800	" "
R45	39KΩ	‡	27E393	BTS-39K	De-emphasis
R49	10MΩ 20%	‡	27E106	BTS-10 Meg.	AF Grid
R47	220KΩ 20%	‡	27E224	BTS-220K	AF Plate
R48	220KΩ 20%	‡	27E224	BTS-220K	" "

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: AIRLINE PART No.	IRC PART No.	IDENTIFICATION CODES
R45	470KΩ 20%	‡	27E474	BTS-470K	Output Grid
R50	180Ω	‡	27E181-2	BW-½-180	Output Cathode
R51A	400Ω	5	27E100-6	AB-400	Filter (Wire Wound)
B	120Ω	5		AB-125	Filter (Wire Wound)
R52	330Ω	1	27E330-3		Surge Limiter
R53	1 Meg. 20%	‡	27E106	BTS-1 Meg.	Sync. Sep. Grid
R54	270Ω	‡	27E271	BW-½-270	Sync. Sep. Cathode See Note 7
R55	470Ω	‡	27E223	BTS-470	" "
R56	220KΩ	‡	27E224	BTS-220K	Sync. Sep. Plate
R57	100KΩ	‡	27E104	BTS-100K	Phase Correction
R58	10KΩ	‡	27E103	BTS-10K	Voltage Divider See Note 1
R59	47KΩ	‡	27E473	BTS-47K	Integrator
R60	47KΩ	‡	27E473	BTS-47K	"
R61	68KΩ	‡	27E683	BTS-68K	"
R62	22KΩ	‡	27E223	BTS-22K	Vert. Osc. Grid
R63	470Ω	‡	27E471	BTS-470	Vert. Osc. Cathode
R64	47KΩ	1	27E473-3	BTA-47K	Vert. Osc. Plate
R65	470KΩ	‡	27E474	BTS-470K	Vert. Osc. Grid
R66	470KΩ	‡	27E474	BTS-470K	Vert. Osc. Plate
R67	22KΩ	‡	27E223	BTS-22K	Voltage Divider
R68	270KΩ	‡	27E274	BTS-270K	" "
R69	1 Meg.	‡	27E105	BTS-1 Meg.	" "
R70	22KΩ	‡	27E223	BTS-22K	Vert. Amp. Cathode
R71	4.7 Meg.	‡	27E1017	BTA-4.7 Meg.	Vert. Amp. Plate
R72	100KΩ	‡	27E104	BTS-100K	Vert. Amp. Grid
R73	4 Meg.	‡	27E1009-4		Voltage Divider
R74	4.7 Meg.	‡	27E1017	BTA-4.7 Meg.	Vert. Deflection Load
R75	820Ω	‡	27E821	BTS-820	Voltage Divider See Note 2
R76	470KΩ	‡	27E474	BTS-470K	Horiz. Osc. Grid See Note 3
R77	100Ω	2	27E102	BTS-1000	Horiz. Osc. Cathode
R78	100KΩ 20%	‡	27E104	BTS-100K	Horiz. Osc. Plate
R79	220KΩ 20%	‡	27E224	BTS-220K	Horiz. Osc. Grid
R80	1 Meg.	2	27E106-5	BT-2-1 Meg.	Horiz. Osc. Plate See Note 4
R81	680KΩ	‡	27E684	BTS-680K	Voltage Divider
R82	33KΩ	‡	27E333	BTS-33K	" "
R83	470KΩ	‡	27E474	BTS-470K	Horiz. Amp. Grid
R84	220KΩ 20%	‡	27E225	BTS-2200	Horiz. Amp. Cathode
R85	470KΩ 20%	‡	27E474	BTS-470K	Horiz. Amp. Grid
R86	100KΩ	2	27E104-5	BT-2-100K	Horiz. Amp. Plate
R87	470Ω	2	27E822	BTS-6200	" "
R88	100KΩ	2	27E104-5	BT-2-100K	Horiz. Amp. Plate
R89	33KΩ	‡	27E683	BTS-33K	HV Osc. Grid
R90	33KΩ	1	27E333-3	BTA-33K	HV Osc. Screen
R91	47Ω	‡	27E470	BW-½-47	Filter
R92	47Ω	‡	27E530		Parasitic Supp.
R93	100KΩ	‡			HV Filter
R94	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	Filament Isolation
R95	4.7Meg. 20%	‡	27E475	BTS-4.7 Meg.	Vert. Deflection Load
R96	3.9Meg. 20%	‡	27E395-2	BTS-3.9 Meg.	Horiz. Deflection Load
R97	4.7Meg. 20%	‡	27E475	BTS-4.7 Meg.	Vert. Deflection Load
R98	3.9Meg. 20%	‡	27E395-2	BTS-3.9 Meg.	Horiz. Deflection Load
R99	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	Voltage Divider
R100	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" "
R101	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" "
R102	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" "
R103	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	Voltage Divider See Note 7
R104	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" "
R105	4.7Meg. 20%	‡	27E1017		Voltage Divider See Note 6
R106	4.7 Meg.	2	27E1017		" " "
R107	470KΩ	2	27E474-2	BTS-470K	" "
R108	390Ω	2	27E1015	BW-2-390	Filter (Wire Wound)
R109	10Ω	‡	27E1014		Surge Limiter
R110	150KΩ	‡	27E154	BTS-150K	Picture Tube Grid
R111	10KΩ	‡	27E103	BTS-10K	Voltage Divider See Note 8
R112	15KΩ	‡	27E153	BTS-15K	See Note 7

* Items C89A, C89B and R83 are combined into one unit, obtainable under HFGR'S Part No. 23E2022-3.

Note 1. Some models use 470ΩΩ resistor in this application.

Note 2. Some models use one 470Ω resistor in this application, or two 470Ω resistors in series to obtain correct resistance and wattage.

Note 3. Some models use 12KΩ resistor in this application.

Note 4. Some models use three 330KΩ resistors in series to obtain correct resistance and wattage.

Note 5. Some models use 68Ω resistor in this application.

Note 6. Some models use two 2.4 Meg resistors in series to obtain correct resistance and wattage.

Note 7. Not used in all models.

Note 8. Some models use 8200Ω resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: AIRLINE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC	120VAC @ 1.1A A 5.2VAC @ 2A	6.3VAC @ .6A	2.5VAC @ 4.4A	23S27	P-8158		

TRANSFORMER (H.V. OSC.)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: SEC. 1	AIRLINE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	NOTES
T2	1.7Ω	5900 BLK. 2 OR BRN. 2 1025	20E270				

AIRLINE MODEL 84GSE3011A

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		AIRLINE	STANCOR	MERIT	CHICAGO	
	PRI.	SEC.	PRI.	SEC.	PART No.	PART No.	PART No.	PART No.	
T3	3800Ω	3.5Ω	250Ω	.4Ω	22E28	A-3877	A-2930	RO-9 ‡	‡ Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			NOTES
	FIELD RES.	V. C. IMP.	AIRLINE PART No.	JENSEN PART No.	QUAM PART No.	
SP1	PM	3.5Ω	1E31	ST-107 MOD.P5-V	5A15	
	CONE DIA.	V. C. DIA.				
SP2	4 3/4"	9/16"				

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				INSTALLATION NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ~)	AIRLINE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
L1	.143A	136Ω	3.2Henries	22E36	C-2304 ‡	C-2974	TR-4200‡	‡ Drill one new mounting hole.

COILS (RF-IF)

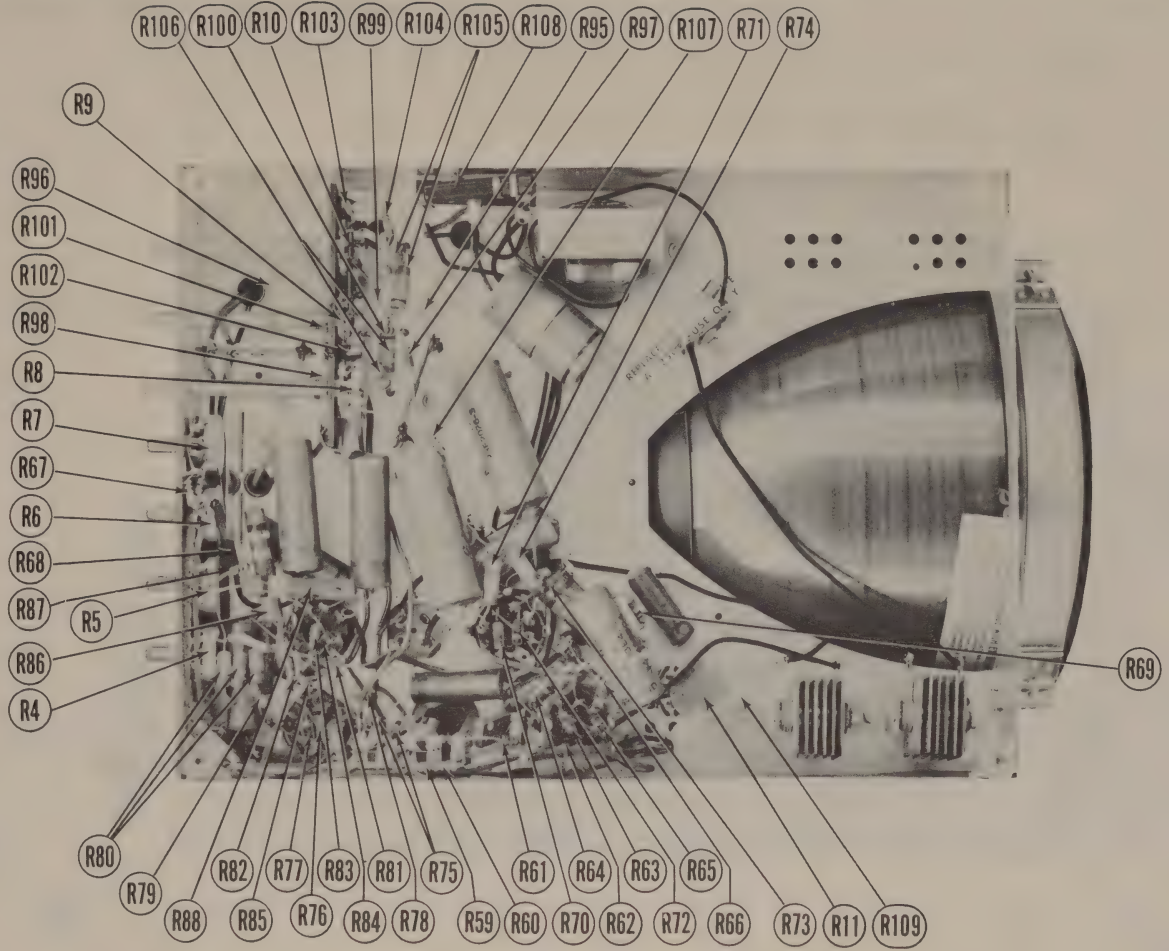
ITEM No.	USE	DC RES.		REPLACEMENT DATA		NOTES
		PRI.	SEC.	AIRLINE PART No.	MEISSNER PART No.	
L2	Ant. Loading Coil	0Ω				Channels 7-13, part of tuner.
L3	Ant. Loading Coil	0Ω				Channels 7-13, part of tuner.
L4	RF Choke	0Ω				Part of tuner.
L5	1st Video IF	.1Ω		20E360		
L6	2nd Video IF	.1Ω		20E360		
L7	3rd Video IF	.1Ω		20E360		
L8	4th Video IF	2.1Ω		2E79		Wound on 15KΩ resistor.
L9	5th Video IF	.1Ω		20E360		
L10	Peaking	9Ω		20E363-2		Wound on 33KΩ resistor.
L11	Peaking	19.5Ω		20E363-4		Wound on 8.2KΩ resistor.
L12	Peaking	13.5Ω		20E363-3		Wound on 15KΩ resistor.
L13	Peaking	18Ω		20E363-5		Wound on 10 Meg. resistor.
L14	Fil. Choke	.1Ω		2E78		
L15	Fil. Choke	.1Ω		2E78		
L16	Fil. Choke	.1Ω		2E78		
L17	Fil. Choke	.1Ω		2E78		
L18	1st Sound IF	3Ω		20E361		
L19	Ratio Det. Trans.	3.8Ω	.4Ω	20E362		
L20	RF Choke	110Ω		2E75		Part of tuner
L21	Ant. Loading	0Ω				

SELENIUM RECTIFIER

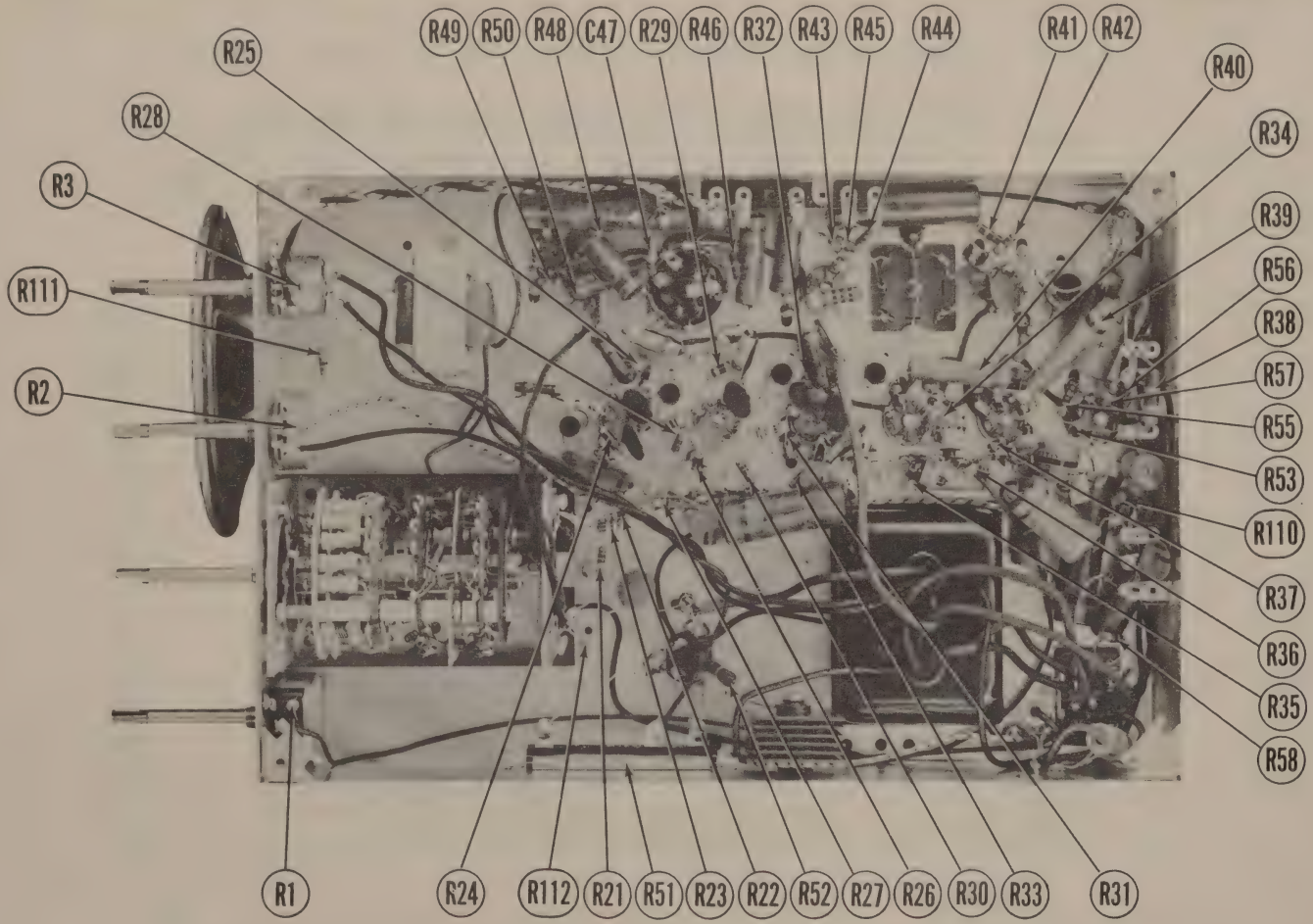
ITEM No.	RATING	REPLACEMENT DATA			NOTES
	CURRENT	AIRLINE PART No.			
M1	.069A	57E3			
M2	.143A	57E3			
M3	.143A	57E3			

MISCELLANEOUS

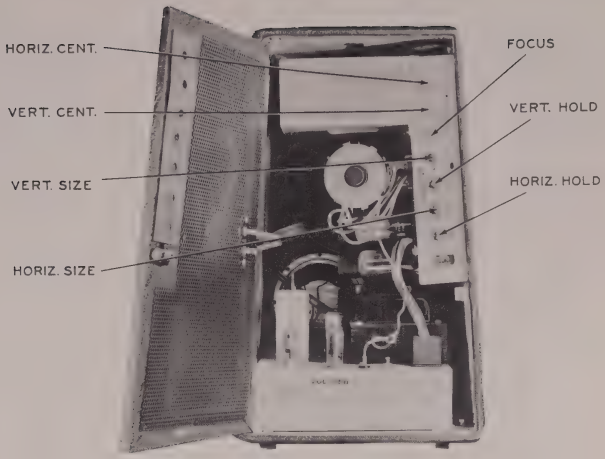
ITEM No.	PART NAME	AIRLINE PART No.	NOTES
M4	RF Tuner	20E364	Includes tuner unit, channel switch and multiple resistor-capacitor combination.
M5	Portable Antenna	64E24	
M6	Fuse		Type AGC .25A
	Cabinet	7E179	
	Cabinet Door	20E449	
	Cabinet Escutcheon	5E47	Metal front plate.
	Knob	20E427	With pointer.
	Knob	37E54	
	Safety Glass	9E15	
	Socket	17E33	12 contact female.
	Plug	17E30	12 contact male.



SWEEP CHASSIS-BOTTOM VIEW-RESISTOR IDENTIFICATION



RF-IF CHASSIS-BOTTOM VIEW- RESISTOR IDENTIFICATON

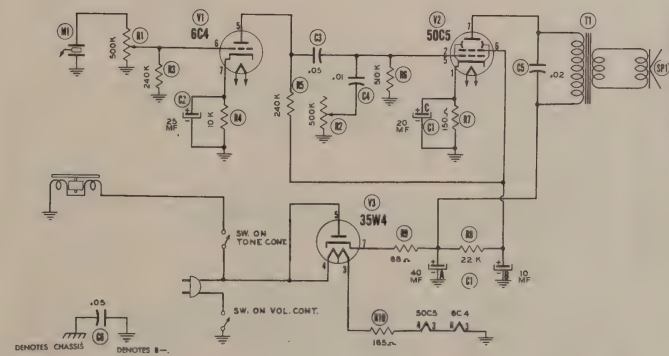


CABINET–REAR VIEW

ARTHUR ANSLEY
MODEL LP-4A

ARTHUR ANSLEY MODEL LP-4A

TRADE NAME	Arthur Ansley, Model LP-4A (Envoy)
MANUFACTURER	Arthur Ansley MFG. Co., Doylestown, Pa.
TYPE SET	AC Operated Phono Player with 3 Tube Amplifier
TUBES (THREE)	Types 6C4 AF Amp., 50C5 Power Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC
RATING	.21 Amp. at 117 Volts AC



Pin No.	6C4 Volt.	6C4 Res.	50C5 Volt	50C5 Res.
1	87VDC	1260KΩ	5.1VDC	160Ω
2	0V.	Inf.	0V.	510KΩ
3	0V.	0Ω	6VAC	0Ω
4	6VAC	0Ω	56VAC	50Ω
5	87VDC	1260KΩ	0V.	510KΩ
6	0V.	180KΩ	80VDC	122KΩ
7	2VDC	10KΩ	126VDC	126Ω

Pin No.	35W4 Volt.	35W4 Res.
1	0V.	Inf.
2	0V.	Inf.
3	76VAC	230Ω
4	117VAC	230Ω
5	117VAC	230Ω
6	117VAC	22Ω
7	152VDC	60KΩ

1 Measured from pin 7 of V3.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1950 by Howard W. Sams & Co., Inc., Indianapolis Indiana, U. S. of America. Copyright under International Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: ARTHUR ANSLEY PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	AF Amp.	6C4	6C4	6BG	
V2	Power Output	50C5	50C5	7CV	
V3	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: A. ANSLEY PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	150		PRSA86D4A	EDL4215C		TA-305	Filter Yellow
B	10	150						Filter Red
C	20	25						Output Cath. Bypass Blue
C2	25	25		PRS25/25	BR252A		TA-25	AF Amp. Cath. Bypass
C3	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C4	.01	400		P488-01	GT4S1	GP2-335-01	TM-11	Tone Compensation
C5	.02	400		P488-02	GT4S2		TM-12	Output Plate Bypass
C6	.05	400		P488-05	GT4S5		TM-15	Line Isolation

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: A. ANSLEY PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	500KΩ	½		Q13-133	M-60-Z	Volume control
B	Switch			76-1	SW-A	Attach to R1A per instructions
R2A	500KΩ	½		Q13-133	M-60-Z	Tone control
B	Switch			76-1	SW-A	Attach to R2A per instructions

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: A. ANSLEY PART No.	IRC PART No.	IDENTIFICATION CODES
R3	240KΩ	½		BTS-220K	AF Grid
R4	10KΩ	½		BTS-10K	AF Cathode
R5	240KΩ	½		BTS-220K	AF Plate
R6	510KΩ	½		BTS-470K	Output Grid
R7	150Ω	½		BW-½-150	Output Cathode
R8	22KΩ	½		BTS-22K	Filter
R9	68Ω	1			Surge Limiter
R10	165Ω	10			Filament Dropping Wire Wound

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: A. ANSLEY PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T1	1900Ω	3.6Ω	175Ω	.7Ω		A-3876	A-2928	R0-2	

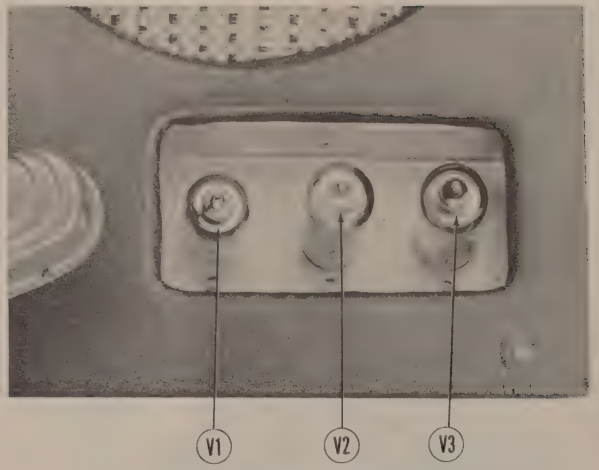
SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA: ARTHUR ANSLEY PART No.	JENSEN PART No.	QUAM PART No.	INSTALLATION NOTES
	FIELD	V. C. IMP.		ST-810 *		
SP1	PM	3.6Ω		MOD. P69-V	69A2 *	* Remount output transformer
	CONE DIA.	V. C. DIA.				
SP2	6 x 8 7/8"	3/4"				

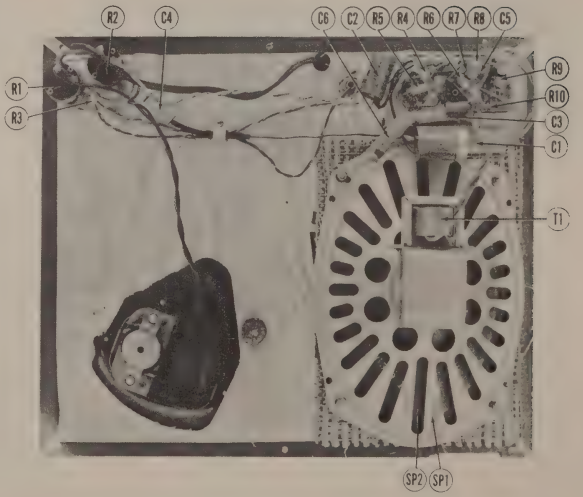
PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: A. ANSLEY PART No.	REPLACEMENT DATA: ASTATIC PART No.	REMARKS
M1		ACD-J	

CHASSIS—TOP VIEW



CHASSIS—BOTTOM VIEW



CORONADO MODELS
94RA33-43-8130C, 94RA33-43-8131C

CORONADO MODELS
94RA33-43-8130C, 94RA33-43-8131C

TRADE NAME	Coronado, Models 94RA33-43-8130C, 94RA33-43-8131C
SUPPLIER	Gamble-Skogmo, Inc., 15 N. 8th St., Minneapolis, Minnesota
TYPE SET	AC-DC Operated Superheterodyne Receiver with Loop Antenna
TUBES (FIVE)	Types 12SA7 Converter, 12SK7 IF Amp., 12SQ7 DET-AVC-AF, 50L6GT Power Output, 35Z5GT Rectifier
POWER SUPPLY	110-120 Volts AC-DC RATING .28 Amp. at 117 Volts AC
TUNING RANGE—BROADCAST	535-1630KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set dial pointer turn tuning gang fully closed and set pointer one inch to the left of the extreme right hand limit on the dial backplate.

Use isolation transformer if available. If not connect a .1MFD capacitor in series with low side of signal generator and B-.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to stator of front section of tuning gang. Low side to B-.	455KC (400 ~ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	.1MFD	"	1630KC	"	"	A5	"
3.		Loop	1400KC	Tune for max. output.	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: CORONADO PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	Converter	12SA7	12SA7	8R	
V2	IF Amp.	12SK7	12SK7	8N	
V3	DET.-AVC-AF	12SQ7	12SQ7	8Q	
V4	Power Output	50L6GT	50L6GT	7AC	
V5	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: CORONADO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	150	C40-20-1.5	PRS150/20-40	EDL4215		TA-240	Filter Red
B	20	150						Filter Blue
C2	.02	600	C026	P688-02	PTE6S2		TM-12	Tuning Cap. Isolation
C3	.05	400	C054	P488-05	PTE4S5		TM-15	AVC Filter
C4	.05	200	C052	P288-05	PTE4S5		TM-15	AVC Filter-Note
C5	.05	200	C052	P288-05 †	PTE4S5 †		72P51	Line Isolation
C6	250	500	C2505M	1468-00025	5W5T25	GP2K-250	1FM-325	Diode RF Filter
C7	250	500	C2505M	1468-00025	5W5T25	GP2K-250	1FM-325	Diode RF Filter See Note
C8	.005	600		P688-005	PTE6D5	GP2M-005	TM-25	Audio Coupling
C9	250	500	C2505M	1468-00025	5W5T25	GP2K-250	1FM-325	AF Amp. Plate Bypass

Note. Not used in all models.
† When replacing rewind same number turns of wire on replacement part as was on original capacitor.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: CORONADO PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	R105VCS	Q13-137	15/16-63-Z	Volume control
B	Switch		Not Req.	76-1	SPST SW *	Attach to R1A per instructions

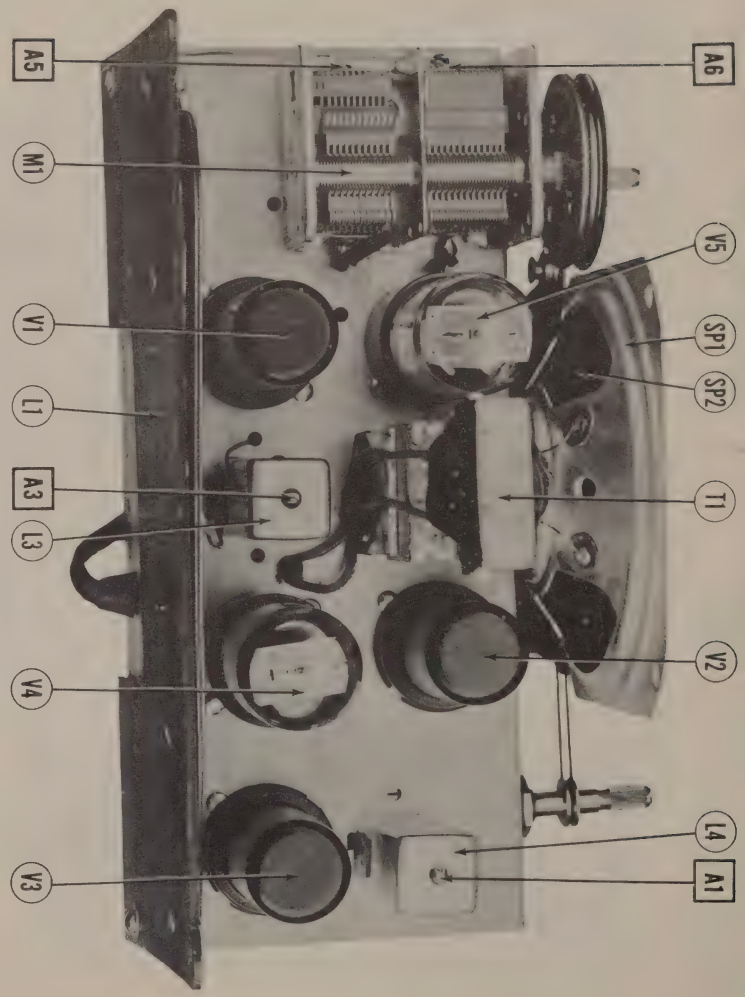
* Attached at factory.

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: CORONADO PART No.	IRC PART No.	IDENTIFICATION CODES
R2	22KΩ		R223.5	BTS-22K	Osc. Grid
R3	220KΩ		R224.5	BTS-220K	1st IF Transformer Shunt
R4	1 Meg.		R105.5	BTS-1 Meg.	AVC Network
R5	47KΩ		R473.5	BTS-47K	Diode Filter
R6	10 Meg.		R106.5	BTS-10 Meg.	AF Grid
R7	470KΩ		R474.5	BTS-470K	AF Plate
R8	470KΩ		R474.5	BTS-470K	Output Grid
R9	120Ω		R121.5	BW-½-120	Output Cathode, Wire Wound
R10	10KΩ	1	R1031	BTA-10K	Voltage Divider
R11	1000Ω	1	R1021	BW-1-1000	Filter
R12	470KΩ		R474.5	BTS-470K	Isolation See Note
R13	27Ω		R270.5		Rect. Ballast, Wire Wound

Note. Not used in all models.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		CORONADO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	2.4KΩ	3.4Ω	168Ω	.5Ω	E-81645-T	A-3332 #	A-3025 #	RO-2	# Bend mounting tabs down and mount on original bracket.

SPEAKER

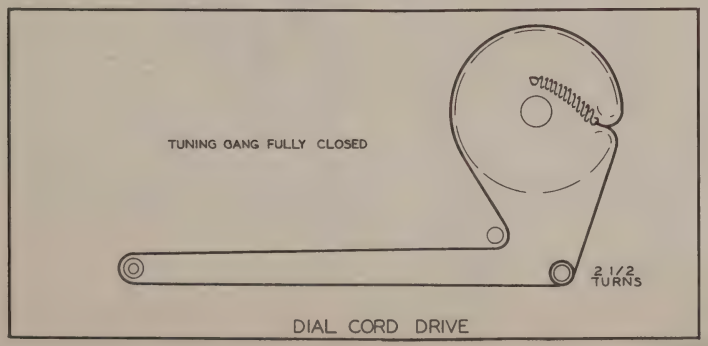
ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			CORONADO PART No.	JENSEN PART No.	QUAM PART No.	
	FIELD	V. C. IMP.		ST-113 *		
SP1	PM	3.4Ω	E-81645-S	MOD. P4-X	4A07 *	* Remount output transformer.
	CONE DIA.	V. C. DIA.				
SP2	3 7/8"	9/16"				

R F COILS

ITEM No.	USE	DC RES.		REPLACEMENT DATA	
		PRI.	SEC.	CORONADO PART No.	MEISSNER PART No.
L1	Loop Ant.	1Ω		T65-L	
L2	Osc. Coil	4.8Ω		T65-O	14-1060
L3	Input IF	20Ω	24Ω	T111-31-A	16-6678
L4	Output IF	20Ω	24Ω	T111-31-A	16-6678

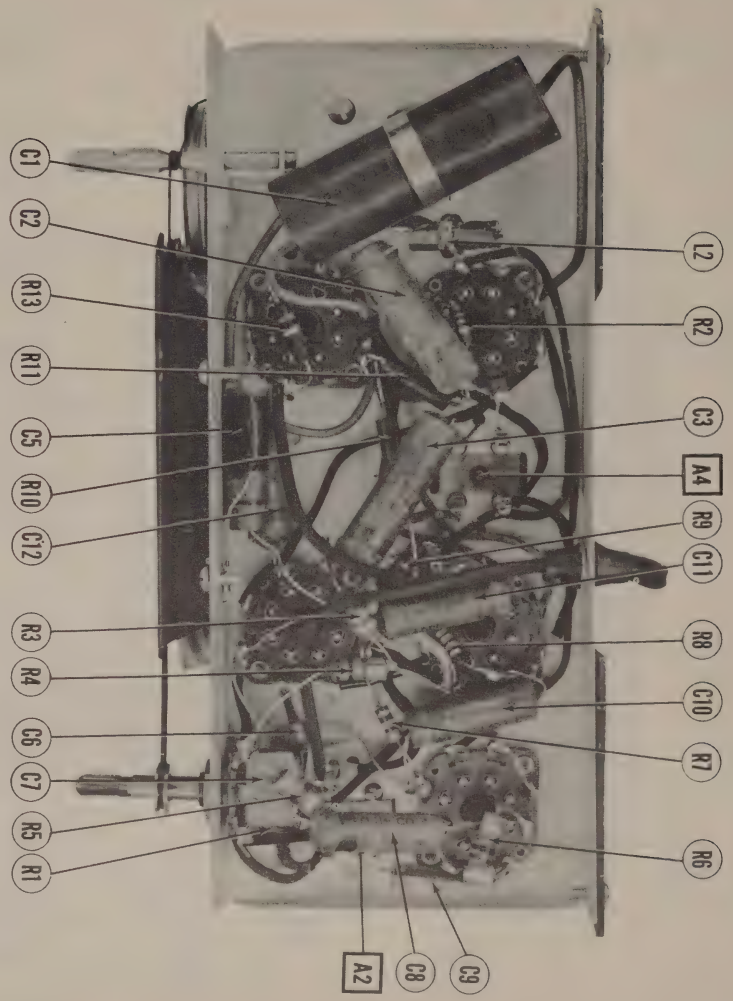
MISCELLANEOUS

ITEM No.	PART NAME	CORONADO PART No.	NOTES
M1	2 Gang. Var. Cap.	E81650-1	(26-438MMF, 38-235MMF)
	Dial Pointer	M1601	
	Cabinet	P1601	Ivory
	Cabinet	P1601A	Brown
	Knob	H81649-8	Ivory
	Knob	H81649-8A	Brown



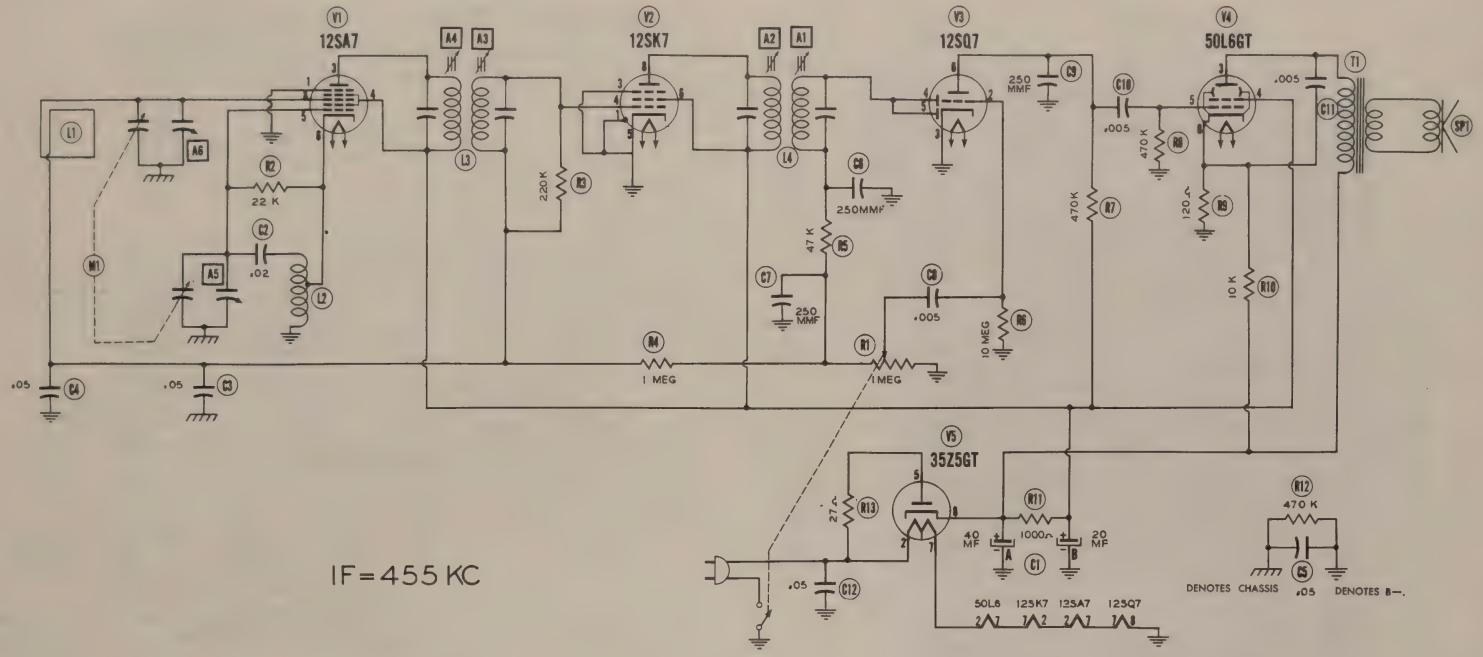
DIAL CORD DRIVE

CHASSIS—BOTTOM VIEW



CORONADO MODEL 94RA33-43-8130C

CORONADO MODEL 94RA33-43-8130C



VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12SA7	0V.	24VAC	90VDC	90VDC	§-9.2VDC	0V.	12VAC	-.4VDC
V 2	12SK7	0V.	24VAC	0V.	-.4VDC	0V.	90VDC	36VAC	90VDC
V 3	12SQ7	0V.	-.8VDC	0V.	-.5VDC	-.5VDC	50VDC	12VAC	0V.
V 4	50L6GT	0V.	85VAC	115VDC	90VDC	0V.	-.4VDC	36VAC	6VDC
V 5	35Z5GT	0V.	117VAC	110VAC	0V.	115VAC	0V.	85VAC	122VDC

§TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12SA7	0Ω	24Ω	†1000Ω	†1000Ω	22KΩ	.5Ω	12Ω	2 Meg.
V 2	12SK7	0Ω	24Ω	0Ω	2 Meg.	0Ω	†1000Ω	36Ω	†1000Ω
V 3	12SQ7	0Ω	10 Meg.	0Ω	1 Meg.	1 Meg.	†470KΩ	†2Ω	0Ω
V 4	50L6GT	0Ω	85Ω	†160Ω	†1000Ω	470KΩ	2 Meg.	36Ω	120Ω
V 5	35Z5GT	Inf.	120Ω	110Ω	Inf.	145Ω	4.8Ω	85Ω	10KΩ

† Measure from pin 8 of V5.

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

DAVID BOGEN
MODEL HX30

DAVID BOGEN
MODEL HX30

DAVID BOGEN MODEL HX30

TRADE NAME	David Bogen, Model HX30
MANUFACTURER	David Bogen Co., Inc., 663 Broadway, New York 12, New York
TYPE SET	AC Operated 4 Channel Audio Amplifier with Provision for Remote Control
TUBES (TEN)	Types 6SC7 Mic. 1 Pre Amp., 6SC7 . Mic. 2 Pre Amp., 6SC7 Mic. 3 Pre Amp., 6SC7 1st AF Amp., 6SL7GT 2nd AF Amp., 6SC7 3rd AF Amp., 6SL7GT 4th AF-Phase Inv., (2) 6L6G Power Output, 5U4G Rectifier
POWER SUPPLY	110-120 Volts AC RATING 1.26 Amp. at 117 Volts AC

INPUTS

The amplifier is designed for three high impedance microphone inputs and one high impedance phonograph input. Input impedances are approximately 500KΩ. Low impedance microphone inputs may be provided by the addition of tapped input transformers giving a choice of input impedances of 50, 200 or 500 ohms.

OUTPUTS

Standard speaker voice coil impedances of 4, 8, and 15 ohms are provided. In addition, two constant voltage taps of 70 and 140 volts are provided. Speaker lines may be connected directly to the output sockets by standard five prong connector plugs. The proper impedance or voltage may be selected by connecting the lug on the flexible lead to the desired terminal on the output strip.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: DAVID BOGEN PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	Mic. #1 Pre Amp.	6SC7	6SC7	8S	
V2	Mic. #2 Pre Amp.	6SC7	6SC7	8S	
V3	Mic. #3 Pre Amp.	6SC7	6SC7	8S	
V4	1st AF Amp.	6SC7	6SC7	8S	
V5	2nd AF Amp.	6SL7GT	6SL7GT	8BD	
V6	3rd AF Amp.	6SC7	6SC7	8S	
V7	4th AF Amp.-Phase Inverter	6SL7GT	6SL7GT	8BD	
V8	Power Output	6L6G	6L6G	7AC	
V9	Power Output	6L6G	6L6G	7AC	
V10	Rectifier	5U4G	5U4G	5T	

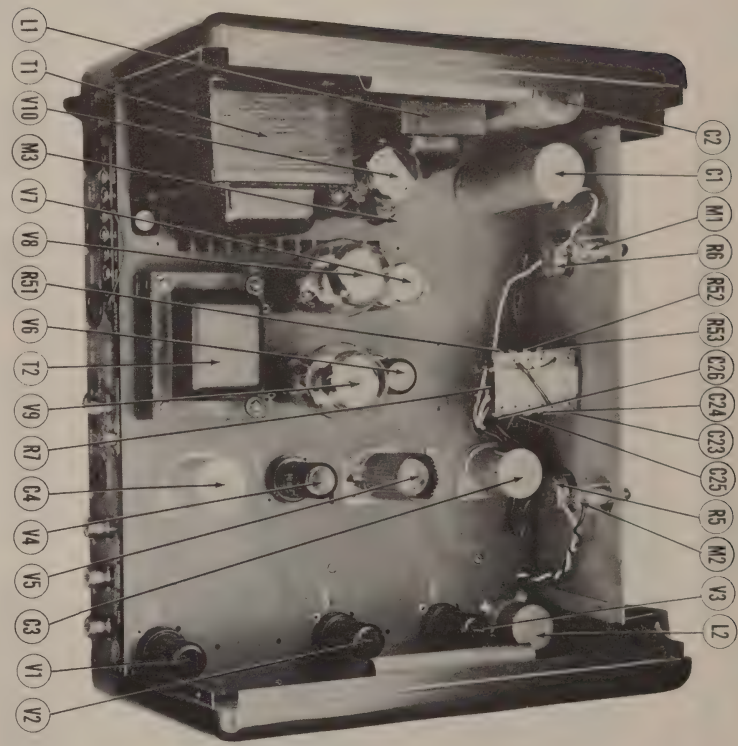
CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: D. BOGEN PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1	4	600		GL600/4	TLAD6040		AP-46	Filter
C2A	8	500		GL475/8-8	EB10018		CL-88	Filter Red-Black
B	8	500						Filter-Blue-Yellow
C3A	5	450		AF2222J	UP5Q45		EL-410	■ Decoupling
B	5	450						● Decoupling
C	5	450						▲ Decoupling
D	5	450						Decoupling
C4A	5	450		AF2222J	UP5Q45		EL-410	▲ Decoupling
B	5	450						■ Decoupling
C	5	450						● Decoupling
D	5	450						Decoupling
C5	50	50		PRS50/50	BR505		TVA-16	Output Cathode Bypass
C6	100	25		PRS25/100	BRH251		UHC-102	Audio Cathode Bypass
C7	100	25		PRS25/100	BRH251		UHC-102	Audio Cathode Bypass
C8	100	25		PRS25/100	BRH251		UHC-102	Audio Cathode Bypass
C9	100	25		PRS25/100	BRH251		UHC-102	Audio Cathode Bypass
C10	100	25		PRS25/100	BRH251		UHC-102	Audio Cathode Bypass
C11	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C12	.25	200		P488-25	GT2P25		TC-2	Audio Coupling
C13	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C14	.25	200		P488-25	GT2P25		TC-2	Audio Coupling
C15	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C16	.25	200		P488-25	GT2P25		TC-2	Audio Coupling
C17	100	500		1468-0001	5W5T1		1FM-31	Audio Coupling
C18	.01	600		P688-01	GT6S1	GP2-335-01	TM-11	Audio Coupling
C19	.01	600		P688-01	GT6S1	GP2-335-01	TM-11	Audio Coupling
C20	.25	200		P488-25	GT2P25		TC-2	Tone Compensation
C21	.003	600		P688-003	GT6D3	GP2M-003	TM-23	Tone Compensation
C22	.5	400		484-5	GT4P5		TC-5	Tone Compensation
C23	2000	500		1467-002	1W5D2	GP2M-002	1FM-22	Tone Compensation See Note 1
C24	2000	500		1467-002	1W5D2	GP2M-002	1FM-22	Tone Compensation See Note 2
C25	2000	500		1467-002	1W5D2	GP2M-002	1FM-22	Tone Compensation
C26	2000	500		1467-002	1W5D2	GP2M-002	1FM-22	Tone Compensation
C27	.25	200		P488-25	GT2P25		TC-2	Audio Coupling
C28	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C29	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C30	.1	400		P488-1	GT4P1		TM-1	Audio Coupling
C31	.1	400		P488-1	GT4P1		TM-1	Audio Coupling
C32	50	500		1468-00005	5W5Q5	GP1K-50	1FM-45	Tone Compensation
C33	.1	500		P688-1	GT6P1		TM-1	Line Filter

Note 1. Some models use 4000MMF in this application.
Note 2. Not used in all models.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

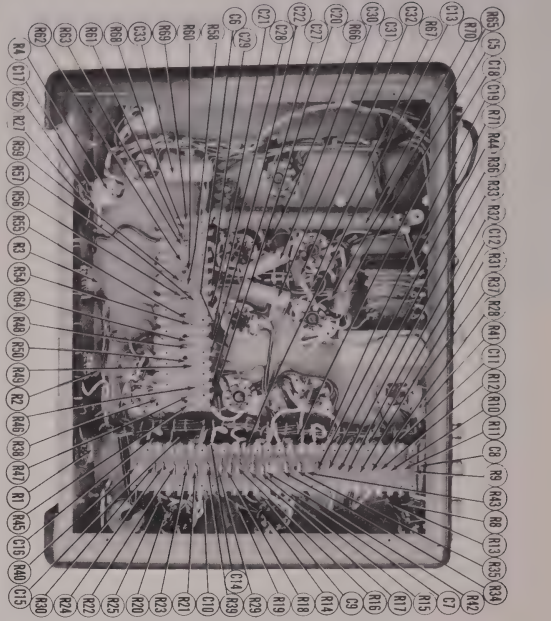
CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA D. BOGEN PART No.	REPLACEMENT DATA IRC PART No.	REPLACEMENT DATA CLAROSTAT PART No.	INSTALLATION NOTES
R1	25KΩ	1	V259B		M-41-W	Microphone 1 volume control
R3	25KΩ	1	V259B		M-41-W	Microphone 2 volume control
R3	25KΩ	1	V259B		M-41-W	Microphone 3 volume control
R4A	500KΩ	1	V-149-A	Q13-133	M-60-Z	Phono volume control
B	Switch		Not Req.	76-1	SW-A	Attach to R4A per instructions
R5	500KΩ	1	V-284	Q11-133	M-61-S	Bass control
R6	500KΩ	1	V-284	Q11-133	M-61-B	Treble control
R7A	150KΩ	1				Anti-feedback control and switch.
B	300KΩ	1	V-282			
C	300KΩ					

RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA DAVID BOGEN PART No.	REPLACEMENT DATA IRC PART No.	IDENTIFICATION CODES
R8	500KΩ	1		BTS-470K	1st Mic. Amp. Grid
R9	220KΩ	1		BTS-220O	1st Mic. Amp. Cathode
R10	220KΩ	1		BTS-220K	1st Mic. Amp. Plate
R11	500KΩ	1		BTS-470K	1st Mic. Amp. Grid
R12	150KΩ	1		BTS-150K	1st Mic. Amp. Plate
R13	75KΩ	1		BTS-82K	Feedback
R14	500KΩ	1		BTS-470K	2nd Mic. Amp. Grid
R15	2200Ω	1		BTS-2200	2nd Mic. Amp. Cathode
R16	220KΩ	1		BTS-220K	2nd Mic. Amp. Plate
R17	500KΩ	1		BTS-470K	2nd Mic. Amp. Grid
R18	150KΩ	1		BTS-150K	2nd Mic. Amp. Plate
R19	75KΩ	1		BTS-82K	Feedback
R20	500KΩ	1		BTS-470K	3rd Mic. Amp. Grid
R21	2200Ω	1		BTS-2200	3rd Mic. Amp. Cathode
R22	220KΩ	1		BTS-220K	3rd Mic. Amp. Plate
R23	500KΩ	1		BTS-470K	3rd Mic. Amp. Grid
R24	150KΩ	1		BTS-150K	3rd Mic. Amp. Plate
R25	75KΩ	1		BTS-82K	Feedback
R26	220KΩ	1		BTS-220K	Audio Coupling
R27	100KΩ	1		BTS-100K	Phono Volume Control Shunt
R28	47KΩ	1		BTS-47K	1st Mic. Amp. Decoupling
R29	47KΩ	1		BTS-47K	2nd Mic. Amp. Decoupling
R30	47KΩ	1		BTS-47K	3rd Mic. Amp. Decoupling
R31	22KΩ	1		BTS-22K	Isolation
R32	22KΩ	1		BTS-22K	Isolation
R33	22KΩ	1		BTS-22K	Isolation
R34	2200Ω	1		BTS-2200	1st AF Cathode
R35	220KΩ	1		BTS-220K	1st AF Plate
R36	220KΩ	1		BTS-230K	Phono Amp. Plate
R37	47KΩ	1		BTS-47K	Phono Amp. Decoupling
R38	33KΩ	1		BTS-33K	1st AF Plate Decoupling
R39	220KΩ	1		BTS-220K	Voltage Dropping
R40	220KΩ	1		BTS-220K	Voltage Dropping
R41	220KΩ	1		BTS-220K	Voltage Dropping
R42	220KΩ	1		BTS-220K	Voltage Dropping
R43	47KΩ	1		BTS-47K	Tone Compensation
R44	100KΩ	1		BTS-100K	Tone Compensation
R45	220KΩ	1		BTS-220K	2nd AF Grid
R46	47KΩ	1		BTS-47K	2nd AF Grid
R47	4700Ω	1		BTS-4700	2nd AF Cathode
R48	150KΩ	1		BTS-150K	2nd AF Plate
R49	100KΩ	1		BTS-100K	2nd AF Cathode
R50	33KΩ	1		BTS-33K	Anti-Feedback Network
R51	20KΩ	1		BTS-22K	Anti-Feedback Network
R52	15KΩ	1		BTS-15K	Anti-Feedback Network
R53	20KΩ	1		BTS-22K	Anti-Feedback Network
R54	500KΩ	1		BTS-470K	3rd AF Grid
R55	3900Ω	1		BTS-3900	3rd AF Cathode
R56	220KΩ	1		BTS-230K	3rd AF Plate
R57	100KΩ	1		BTS-100K	3rd AF Plate

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA DAVID BOGEN PART No.	REPLACEMENT DATA IRC PART No.	IDENTIFICATION CODES
R58	500KΩ	1		BTS-470K	4th AF Grid
R59	22KΩ	1		BTS-22K	4th AF Grid
R60	2200Ω	1		BTS-2200	4th AF Cathode
R61	220KΩ	1		BTS-230K	4th AF Plate
R62	3300Ω	1		BTS-3300	Phase Inv. Grid
R63	220KΩ	1		BTS-220K	Phase Inv. Plate
R64	33KΩ	1		BTS-33K	Decoupling
R65	220KΩ	1		BTS-220K	Feedback
R66	100KΩ	1		BTS-100K	Output Grid
R67	100KΩ	1		BTS-100K	Output Grid
R68	10KΩ	1		BTA-10K	Decoupling
R69	10KΩ	1		BTA-10K	Decoupling
R70A	2500Ω	25		EP-2500	Bleeder, Wire Wound
B	10KΩ	30		EP-10K	Filter, Wire Wound
C	150Ω	30		DG-150	Output Cathode, Wire Wound
R71	25Ω	2		BW-2-25	Bias Network, Wire Wound

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA DAVID BOGEN PART No.	REPLACEMENT DATA STANCOR PART No.	REPLACEMENT DATA MERIT PART No.	REPLACEMENT DATA CHICAGO PART No.
T1	117VAC at 1.28A	1080VCT .160ADC	5VAC at 3A	6.3VAC at 4.1A	T319	P-6170 † †		

† Add series resistor to reduce plate voltage.
† Drill new mounting holes.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE PRI.	RATING IMPEDANCE SEC.	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA DAVID BOGEN PART No.	REPLACEMENT DATA STANCOR PART No.	REPLACEMENT DATA MERIT PART No.	REPLACEMENT DATA CHICAGO PART No.	INSTALLATION NOTES
T2	6.4KΩ CT	500Ω 187Ω 15Ω 8Ω 4Ω	110Ω CT	12Ω 7Ω .45Ω .3Ω .2Ω	T261				

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D.C. RESISTANCE	RATINGS INDUCTANCE @ CURRENT 1000 vA	REPLACEMENT DATA DAVID BOGEN PART No.	REPLACEMENT DATA STANCOR PART No.	REPLACEMENT DATA MERIT PART No.	REPLACEMENT DATA CHICAGO PART No.	INSTALLATION NOTES
L1	160A	98Ω	5.5 Henries	401C	C-1410 †	C-3196 †	R-7150 †	† Drill new mounting holes.

TONE CHOKE

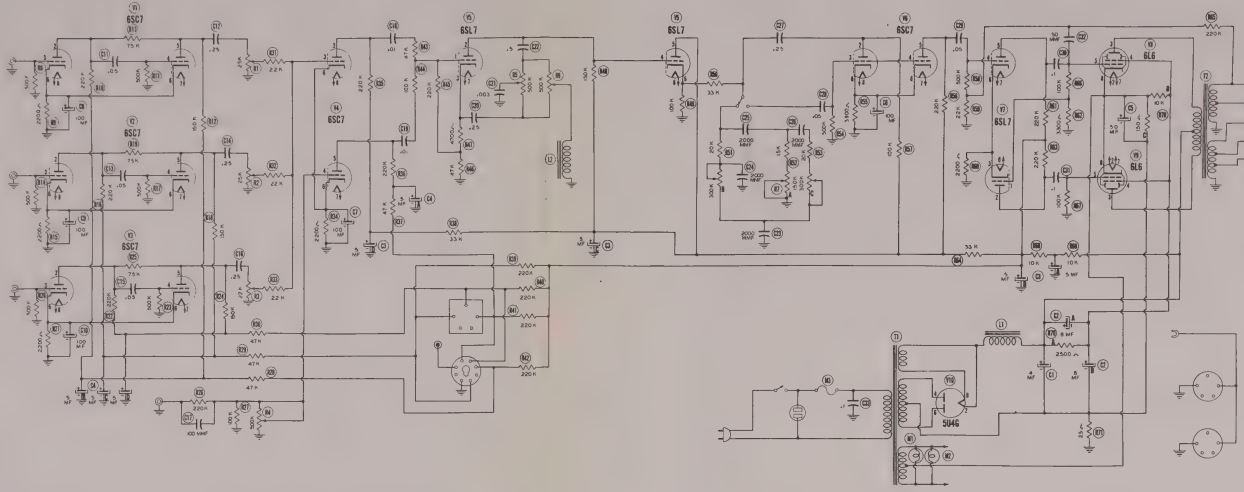
ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D.C. RESISTANCE	RATINGS INDUCTANCE @ CURRENT 1000 vA	REPLACEMENT DATA DAVID BOGEN PART No.	REPLACEMENT DATA STANCOR PART No.	REPLACEMENT DATA MERIT PART No.	REPLACEMENT DATA CHICAGO PART No.	INSTALLATION NOTES
L2		665Ω	15MH	T350				

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA DAVID BOGEN PART No.		NOTES
M1	Bayonet	6-8	.15	Brown			Type #47
M2	Bayonet	6-8	.15	Brown			Type #47

MISCELLANEOUS

ITEM No.	PART NAME	DAVID BOGEN PART No.	NOTES
M3	Fuse		2 Amp. AGC



VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SC7	0V.	90V DC	+0V.	.1V DC	90V DC	1.3V DC	#	#
V 2	6SC7	0V.	90V DC	+0V.	.1V DC	90V DC	1.3V DC	#	#
V 3	6SC7	0V.	90V DC	+0V.	.1V DC	90V DC	1.3V DC	#	#
V 4	6SC7	0V.	185V DC	0V.	0V.	115V DC	1.8V DC	#	#
V 5	6SL7GT	2.2V DC	190V DC	89V DC	130 V DC	65V DC	130V DC	#	#
V 6	6SC7	0V.	165V DC	.1V DC	.1V DC	145V DC	6.6V DC	#	#
V 7	6SL7GT	0V.	190V DC	2.6V DC	.1V DC	6.6V DC	2.6V DC	#	#
V 8	6L6G	0V.	#	425V DC	340V DC	0V.	0V.	#	87V DC
V 9	6L6G	0V.	#	425V DC	340V DC	0V.	0V.	#	87V DC
V 10	5U4G	0V.	440V DC	0V.	530V AC	60V AC	530V AC	60V AC	440V DC

* Input jack open
# 6.3V AC measured across filaments.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SC7	0Ω	135KΩ	+500KΩ	500KΩ	135KΩ	2.2KΩ	175Ω	175Ω
V 2	6SC7	0Ω	135KΩ	+500KΩ	500KΩ	135KΩ	2.2KΩ	175Ω	175Ω
V 3	6SC7	0Ω	135KΩ	+500KΩ	500KΩ	135KΩ	2.2KΩ	175Ω	175Ω
V 4	6SC7	0Ω	190KΩ	75Ω	30Ω	160KΩ	2.2KΩ	175Ω	175Ω
V 5	6SL7GT	870Ω	120KΩ	50KΩ	190KΩ	150KΩ	470Ω	175Ω	175Ω
V 6	6SC7	0Ω	125KΩ	500KΩ	500KΩ	115KΩ	43Ω	175Ω	175Ω
V 7	6SL7GT	5.3KΩ	154KΩ	2.2KΩ	60KΩ	154KΩ	2.2KΩ	175Ω	175Ω
V 8	6L6G	0Ω	175Ω	112Ω	13KΩ	100KΩ	Inf.	175Ω	175Ω
V 9	6L6G	Inf.	175Ω	114Ω	13KΩ	100KΩ	22KΩ	175Ω	175Ω
V 10	5U4G	Inf.	125Ω	Inf.	66Ω	5Ω	66Ω	¼	125Ω

† Measured from pin 2 of V10.
* Input jack open.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values make possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

PHOTOFACT* Folder

*TRADE MARK

DEWALD MODELS
CT-102, CT-103, CT-104, DT-160, DT-161

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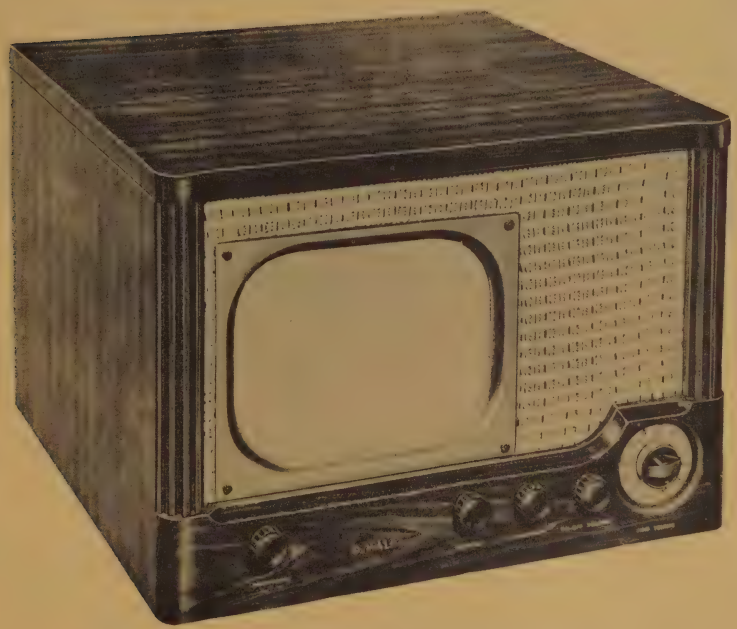

MODEL CT-102

DEWALD MODELS
CT-102, CT-103, CT-104,
DT-160, DT-161

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CT-102, CT-103, CT-104, DT-160, DT-161

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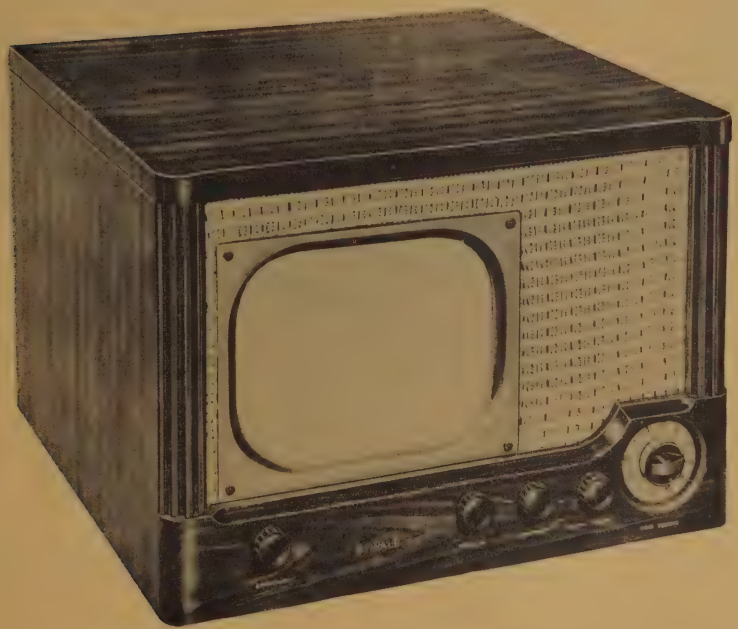

MODEL CT-102

DEWALD MODELS
CT-102, CT-103, CT-104,
DT-160, DT-161

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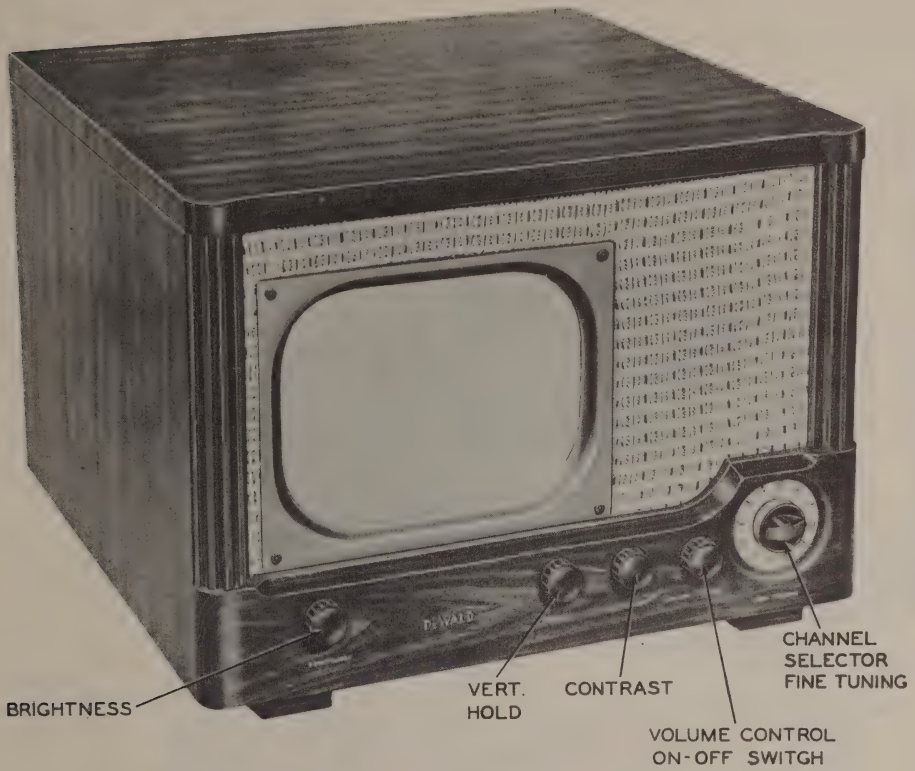
DEWALD MODELS CT-102, CT-103, CT-104, DT-160, DT-161



DEWALD MODELS CT-102, CT-103, CT-104, DT-160, DT-161

DEWALD MODEL CT-102

TRADE NAME	Dewald, Models CT-102, CT-103, CT-104, DT-160, DT-161
MANUFACTURER	Dewald Radio Mfg. Co., 35-15 37th Ave., Long Island City, N. Y.
TYPE SET	Television Receiver
TUBES	Twenty Two
POWER SUPPLY	110 - 120 Volts AC - 60 Cycle
RATING	2.1 Amp. at 117 Volts AC
TUNING RANGE—	Channels 2 thru 13

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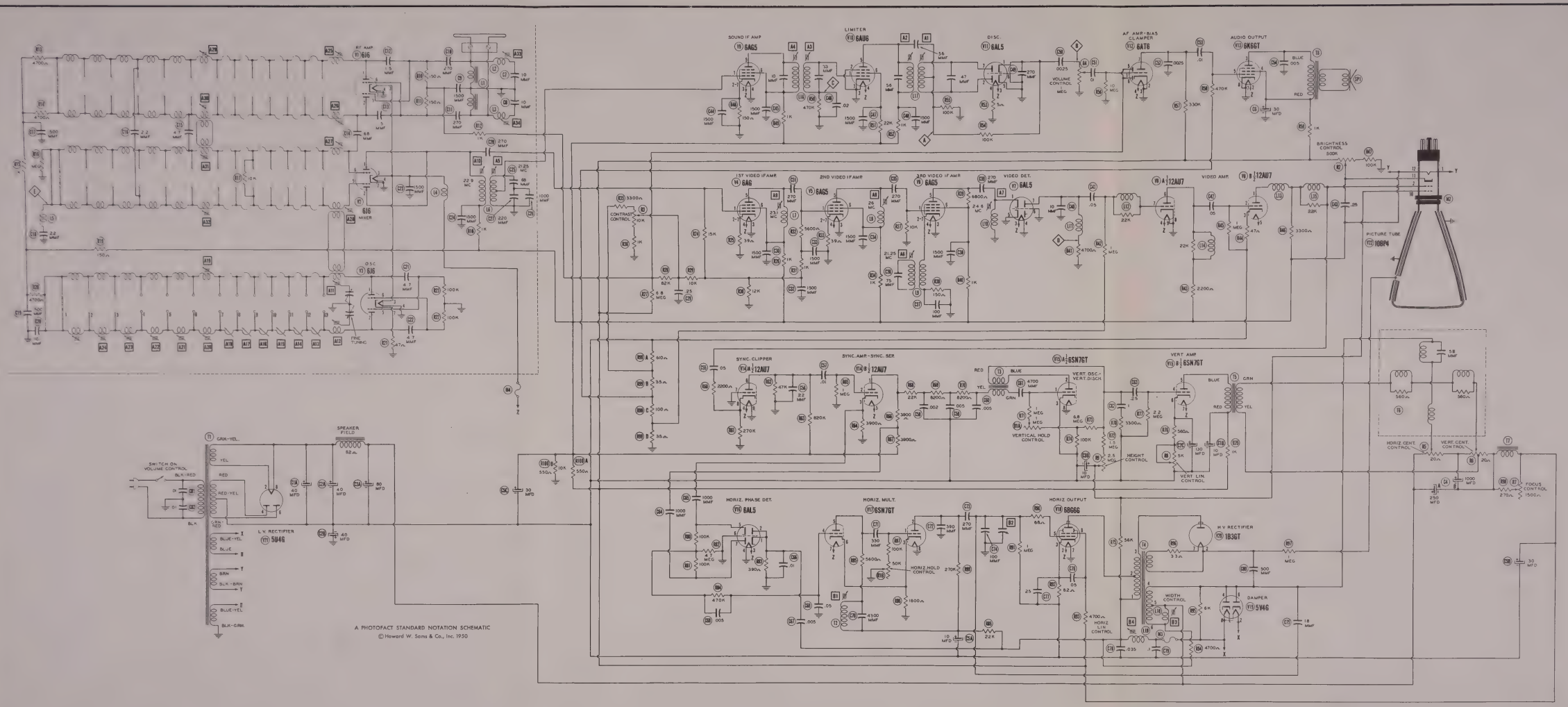
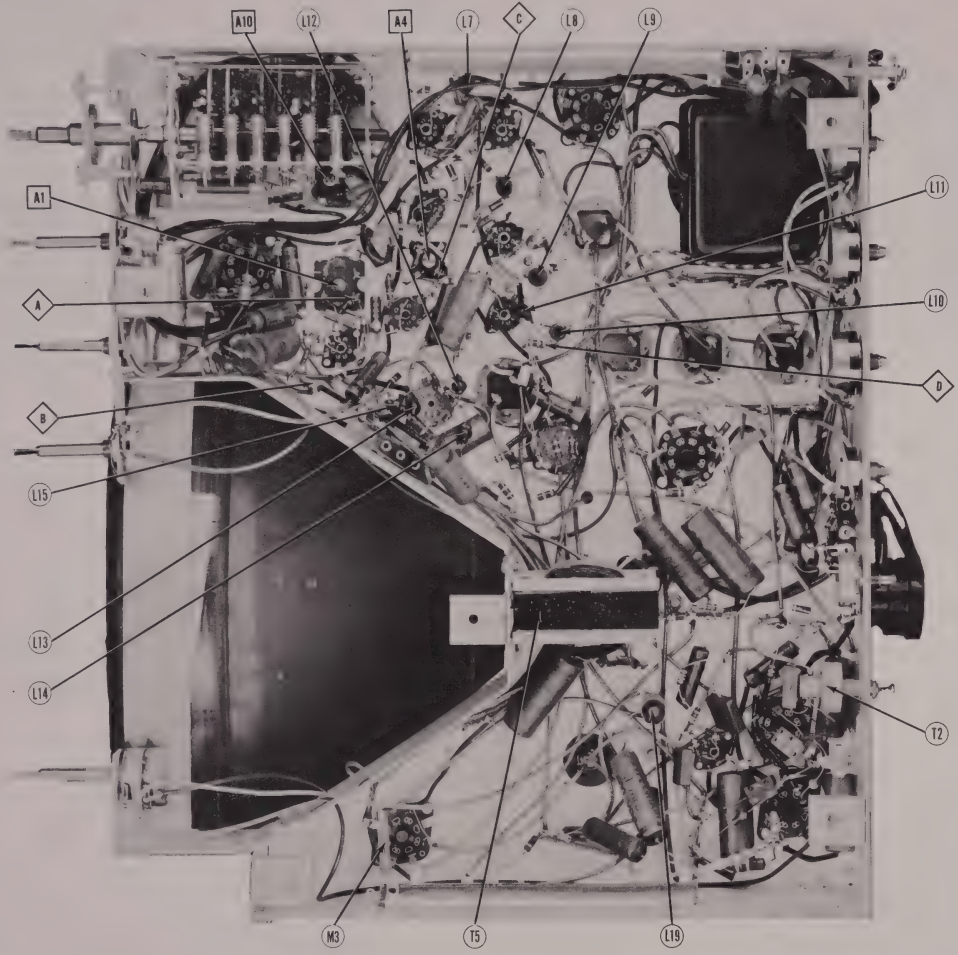
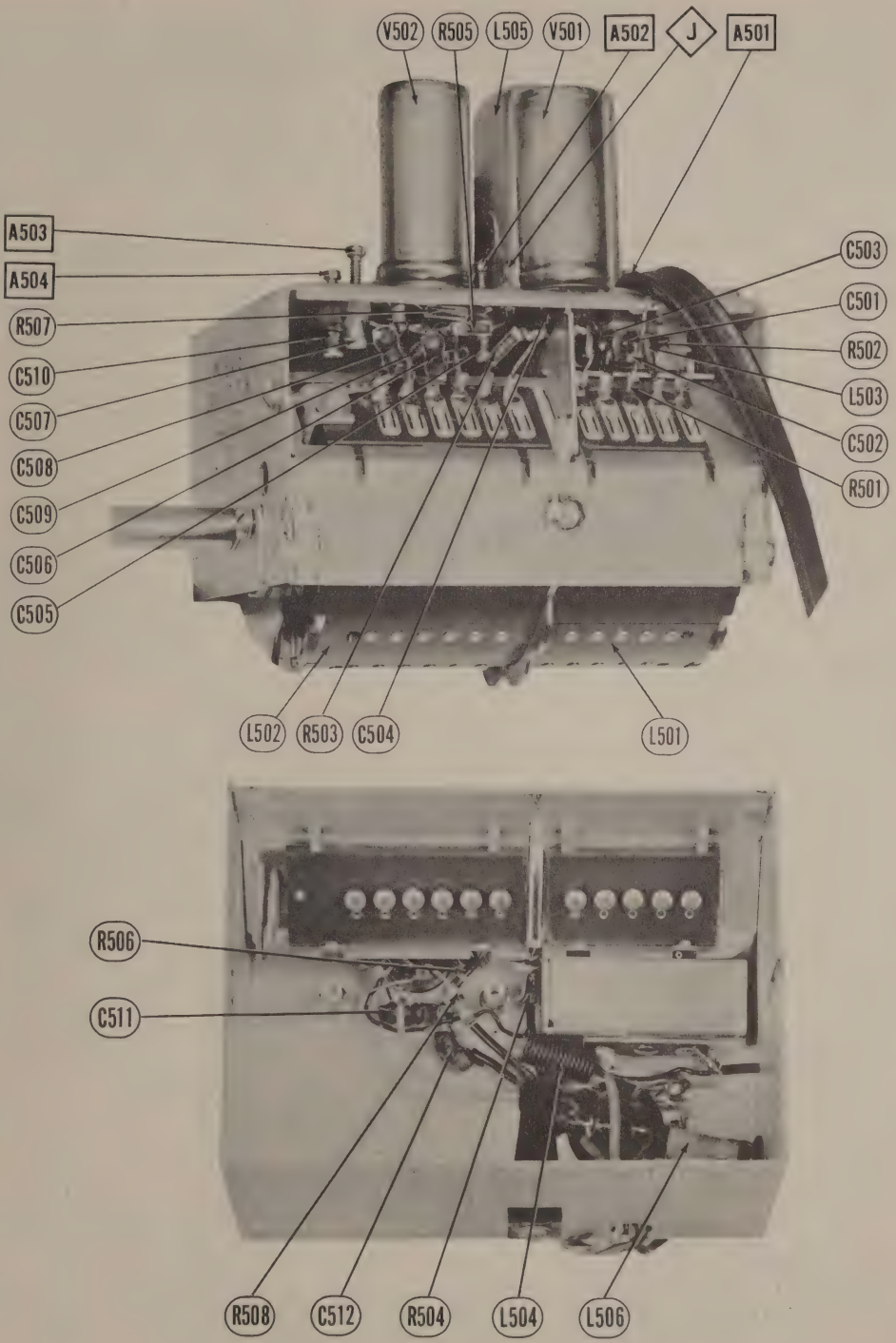


DEWALD MODELS CT-102, CT-103, CT-104, DT-160, DT-161

CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION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V501
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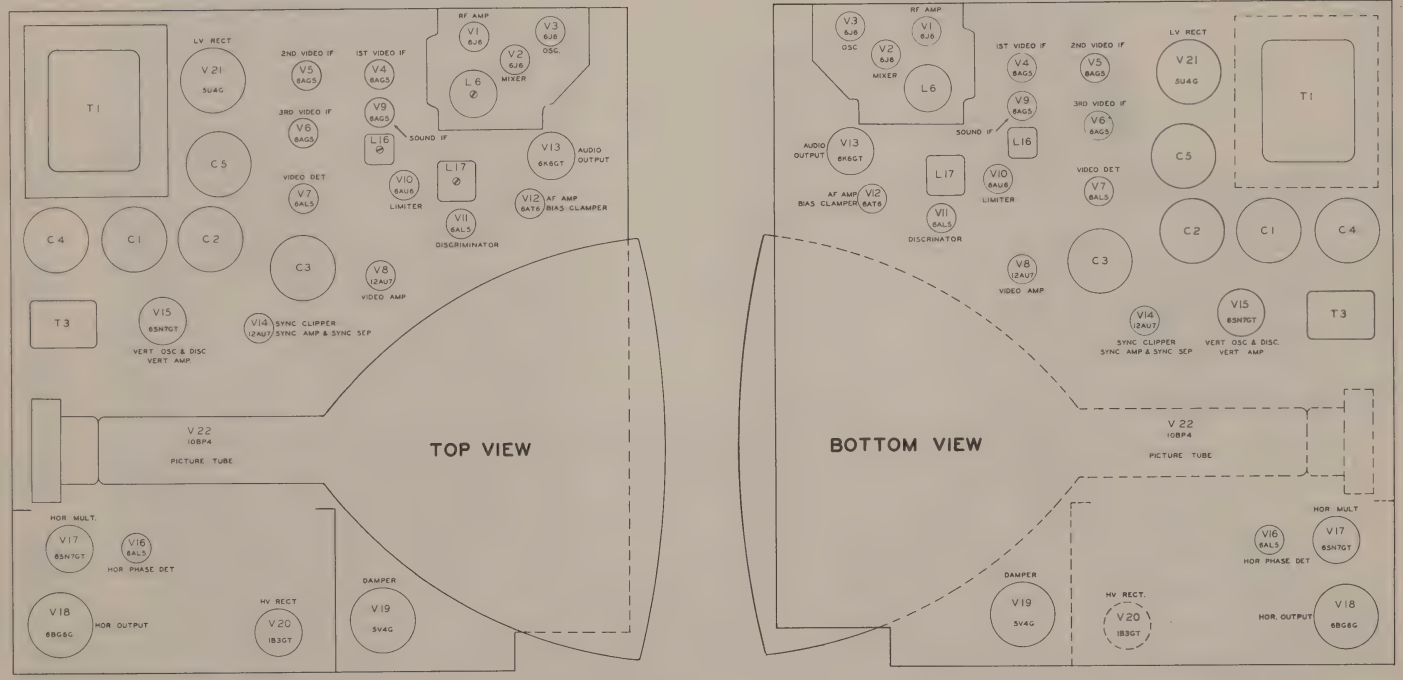


TUBE PLACEMENT CHART

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

If the picture tube is removed during alignment, remove the horizontal oscillator tube V17, to eliminate the high voltage shock hazard.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Set the contrast control to read -3 volts on VTVM connected between junction of R27 and R28 and chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	.01MFD	High side to pin 1(Grid) of 6AU6 (V10). Low side to chassis.	21.25MC (Unmod.)	9 (If unused locally)	DC Probe thru 1 Meg. to Point (A) Common to chassis.	A1, A2	Detune A1 counter-clockwise. Adjust A2 for maximum deflection.
2.	.01MFD	"	"	"	DC Probe thru 1 Meg. to Point (B) Common to chassis.	A1	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
3.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	"	"	DC Probe thru 33KΩ to Point (C) Common to chassis.	A3, A4, A5	Adjust for maximum deflection.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Set the contrast control to read -3 volts on VTVM connected between junction of R27 and R28 and chassis.
Use frequency modulated signal with 60 ~ modulation and 450KC sweep. Use 120 ~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.01MFD	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	21.25MC (1MC Sweep)	21.25MC	9 (If unused locally)	Vert. Amp. to Point (C) Low side to chassis.	A3, A4, A5	Adjust for maximum amplitude and symmetry as per Fig 1.
2.	.01MFD	"	"	"	"	Vert. Amp. to Point (B) Common to chassis.	A1, A2	Adjust A1 so 21.25MC marker occurs at center of crossover lines as per Fig 2. Adjust A2 for maximum amplitude and straightness of crossover lines. Continue with step 4.

VIDEO IF ALIGNMENT

Set the contrast control to read -3 volts on VTVM connected between the junction of R29 and R30, and chassis.
Remove the local oscillator tube V3, to prevent erroneous indications. If the set has a Standard Coil tuner, remove the channel 13 segment of the mixer section the tuner turret and turn the channel switch to channel 13 to disable the local oscillator during video alignment.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
4.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	21.25MC (Unmod.)	Any	DC Probe to Point (D) Common to chassis.	A6	Adjust for MINIMUM deflection.
5.	Direct	"	24.6MC	"	"	A7	Adjust for maximum deflection.
6.	Direct	"	26MC	"	"	A8	"
7.	Direct	"	23.1MC	"	"	A9	"
8.	Direct	"	22.9MC	"	"	A10	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	24MC (10MC Sweep)	21.25MC 23MC 25MC 25.75MC	Any	Vert. Amp. to Point (D) Low side to chassis.		Check for response curve similar to Fig 3 with 25.75MC marker appearing at 50%. If necessary retouch A6 thru A10 for optimum response.

TUNER ALIGNMENT

These receivers employ one of three tuners, determine which tuner is in the set and use the alignment instructions for that tuner.

OSCILLATOR ALIGNMENT (RCA TUNER)

Replace the local oscillator tube V3.
Set the fine tuning control approximately 140 from maximum counter-clockwise. This aligns the holes in the drive disc with the oscillator adjustment screws. Do not change this setting during oscillator alignment.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	Two 150Ω carbon res.	Across antenna terminals with 150Ω in each lead.	215.75MC (Unmod.)	13	DC Probe thru 1 Meg. to Point (B) Low side to chassis.	A11, A12	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Keep slug pairs at approximately the same relative position.
11.	"	"	209.75MC	12	"	A13	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
			203.75MC	11		A14	
			197.75MC	10		A15	
			191.75MC	9		A16	
			185.75MC	8		A17	
			179.75MC	7		A18	
12.	"	"	87.75MC	6	"	A19, A20	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Keep slug pairs at approximately the same relative position.
13.	"	"	81.75MC	5	"	A21	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
			71.75MC	4		A22	
			65.75MC	3		A23	
			59.75MC	2		A24	

SEE PAGE 14 FOR RCA TUNER OSCILLATOR ALIGNMENT POINTS.

ALIGNMENT INSTRUCTIONS (CONT.)

RF AND MIXER ALIGNMENT (RCA TUNER)

Connect a 1000MMF capacitor from pin 1 of the first video IF amp., (6AG5, V4) to chassis with the shortest possible leads.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Two 150Ω carbon res.	Across antenna terminals with 150Ω in each lead.	213MC (10MC Sweep)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to Point (E) Low side to chassis.	A25, A26 A27, A28	Adjust for response curve similar to Fig 4 with markers above 70%. The dip between peaks should not exceed 30%. Keep slug pairs at approximately the same relative position.
15.	"	"	207MC (10MC Sweep)	205.25MC 209.75MC	12	"		Check all high band channels for response curve similar to Fig 4. If markers are below 70% on any channel, make slight adjustment of A25, A26, A27, and A28 with channel switch set for that channel. Recheck all high band channels to see that they have not been seriously effected.
			201MC (10MC Sweep)	199.25MC 203.75MC	11			
			195MC (10MC Sweep)	193.25MC 197.75MC	10			
			189MC (10MC Sweep)	187.25MC 191.75MC	9			
			183MC (10MC Sweep)	181.25MC 185.75MC	8			
			177MC (10MC Sweep)	175.25MC 179.75MC	7			
16.	"	"	85MC (10MC Sweep)	83.25MC 87.75MC	6	"	A29, A30 A31, A32	Adjust for response curve similar to Fig 4 with markers above 70%. Keep slug pairs at approximately the same relative position.
17.	"	"	79MC (10MC Sweep)	77.25MC 81.75MC	5	"		Check all low band channels for response similar to Fig 4. If markers are below 70% on any channel, make slight adjustment of A29, A30, A31, and A32 with channel switch set for that channel. Recheck all low band channels to see that they have not been seriously effected.
			69MC (10MC Sweep)	67.25MC 71.75MC	4			
			63MC (10MC Sweep)	61.25MC 65.75MC	3			
			57MC (10MC Sweep)	55.25MC 59.75MC	2			

WAVE TRAP ALIGNMENT (RCA TUNER)

Wave traps A33 and A34 are used for specific types of interference and their alignment will depend upon the type encountered. With the receiver tuned to the channel having the interference set fine tuning control until interference is at maximum. Adjust A33 and A34 for minimum interference in the picture and sound, keeping the cores at approximately the same relative position. Turn one core 1/2 turn, adjust the other for minimum interference.

OSCILLATOR ALIGNMENT (STANDARD COIL TUNER)

Replace the channel 13 segment of the tuner turret.

Set the fine tuning control to the mid-position of its range.

Complete oscillator alignment may not be necessary. If the oscillator seems to be off frequency approximately the same amount for a majority of the channels, it may be possible to correct them in one step using A504. It should be noted this is an all channel oscillator circuit adjustment and should not be used for any individual channel. If adjustment of A504 will not bring all channels within the range of the fine tuning control, it will be necessary to use the individual channel oscillator adjustments for each channel that is off frequency, (steps 10 and 11).

The individual channel oscillator adjustment screws are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	Two 150Ω carbon res.	Across antenna terminals with 150Ω in each lead.	215.75MC (Unmod.)	13	DC Probe thru 1 Meg. to Point (B) Common to chassis.	A505	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
11.	"	"	209.75MC	12	"	A506	"
			203.75MC	11		A507	
			197.75MC	10		A508	
			191.75MC	9		A509	
			185.75MC	8		A510	
			179.75MC	7		A511	
			87.75MC	6		A512	
			81.75MC	5		A513	
			71.75MC	4		A514	
			65.75MC	3		A515	
			59.75MC	2		A516	

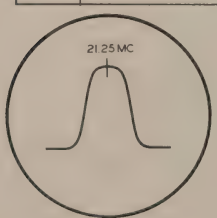


FIG. 1

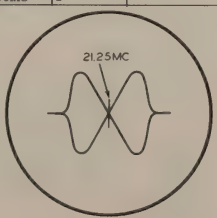


FIG. 2

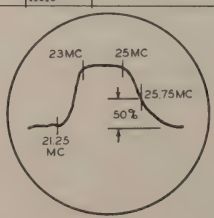


FIG. 3

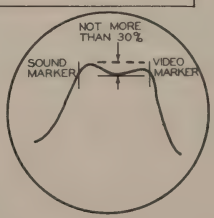


FIG. 4

ALIGNMENT INSTRUCTIONS (CONT.)

RF AND MIXER ALIGNMENT (STANDARD COIL TUNER)

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	207MC (10MC Sweep)	205.25MC 209.75MC	12	Vert. Amp. thru 10KΩ to Point (A) Low side to chassis.	A501, A502, A503	Adjust for response curve similar to Fig 4 with markers above 70%.
13.	"	"	213MC (10MC Sweep)	211.25MC 215.75MC	13	"		Check all channels for response similar to Fig 4. If markers are below 70% on any channel, make slight adjustment of A501, A502, and A503 with channel switch set for channel. Recheck all other channels to see that they have not been seriously effected.
			201MC (10MC Sweep)	199.25MC 203.75MC	11			
			195MC (10MC Sweep)	193.25MC 197.75MC	10			
			189MC (10MC Sweep)	187.25MC 191.75MC	9			
			183MC (10MC Sweep)	181.25MC 185.75MC	8			
			177MC (10MC Sweep)	175.25MC 179.75MC	7			
			85MC (10MC Sweep)	83.25MC 87.75MC	6			
			79MC (10MC Sweep)	77.25MC 81.75MC	5			
			69MC (10MC Sweep)	67.25MC 71.75MC	4			
			63MC (10MC Sweep)	61.25MC 65.75MC	3			
			57MC (10MC Sweep)	55.25MC 59.75MC	2			

OSCILLATOR ALIGNMENT (G. I. TUNER)

Replace the local oscillator tube V3.
Set the fine tuning control to the mid position of its range.

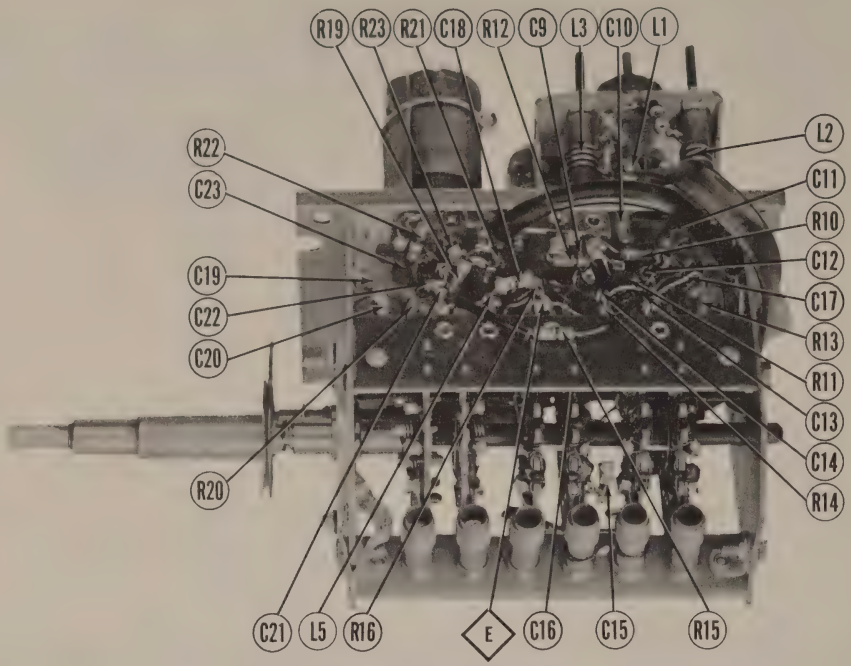
	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	215.75MC	13	DC Probe thru 1 Meg. to Point (B) Common to chassis.	A311	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
11.	"	"	87.75MC	6	"	A312	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Check to see that all channels are received well within the range of the fine tuning control. If not, compromise may be made using A311 for the high band channels and A312 for the low band channels.

RF AND MIXER ALIGNMENT (G. I. TUNER)

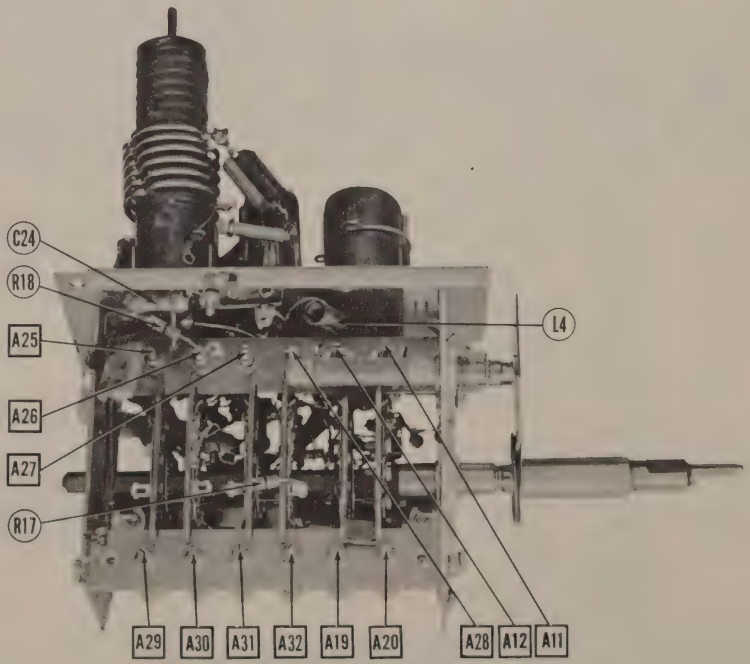
	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	213MC (10MC Sweep)	211.25MC 215.75MC	13	Vert. Amp. to Point (D) Low side to chassis.	A301, A302, A303, A304	Adjust for response curve similar to Fig 4 with markers above 70%. Keep trimmer pairs at approximately the same relative position.
13.	"	"	177MC (10MC Sweep)	175.25MC 179.75MC	7	"	A305, A306	Adjust rings for response similar to Fig. 4 with markers above 70%.
14.	"	"	183MC (10MC Sweep)	181.25MC 185.75MC	8	"		Check all high band channels for response curve similar to Fig 4. SLIGHT adjustments of A301 thru A306 may be necessary to obtain optimum response on all channels.
			189MC (10MC Sweep)	187.25MC 191.75MC	9			
			195MC (10MC Sweep)	193.25MC 197.75MC	10			
			201MC (10MC Sweep)	199.25MC 203.75MC	11			
15.	"	"	85MC (10MC Sweep)	83.25MC 87.75MC	6	"	A307, A308, A309, A310	Adjust for response curve similar to Fig 4 with markers above 70%. Keep trimmers pairs in approximately the same relative position.
16.	"	"	79MC (10MC Sweep)	77.25MC 81.75MC	5	"		Check all low band channels for response similar to Fig 4. If markers are below 70% on any channel, make slight adjustment of A307, A308, A309 and A310 with channel switch set for that channel. Recheck all low band channels to see that they have not been seriously effected.
			69MC (10MC Sweep)	67.25MC 71.75MC	4			
			63MC (10MC Sweep)	61.25MC 65.75MC	3			
			57MC (10MC Sweep)	55.25MC 57.75MC	2			

WAVE TRAP ADJUSTMENTS (G. I. TUNER)

Wave traps A313 and A314 are used for specific types of interference and their alignment will depend upon the type encountered. With the receiver tuned to the channel having the interference set fine tuning control until interference is at maximum. Adjust A313 and A314 for minimum interference in the picture and sound, keeping the cores at approximately the same relative position. Turn one core 1/2 turn, adjust the other for minimum interference.



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6J6	97VDC	97VDC	6.3VAC	0V	-.4VDC	-.4VDC	0V		
V 2	6J6	165VDC	165VDC	6.3VAC	0V	0V	0V	0V		
V 3	6J6	125VDC	125VDC	6.3VAC	0V	-5.3VDC	§-7VDC	.6VDC		
V 4	6AG5	-.8VDC	.5VDC	0V	6.3VAC	150VDC	150VDC	.5VDC		
V 5	6AG5	-.7VDC	.4VDC	0V	6.3VAC	150VDC	150VDC	.4VDC		
V 6	6AG5	0V	1.3VDC	0V	6.3VAC	105VDC	150VDC	1.3VDC		
V 7	6AL5	0V	0V	6.3VAC	0V	0V	0V	-.1VDC		
V 8	12AU7	#190VDC	#0V	#1.1VDC	6.3VAC	6.3VAC	150VDC	-.9VDC	0V	0V
V 9	6AG5	0V	1.4VDC	6.3VAC	0V	150VDC	150VDC	1.4VDC		
V 10	6AU6	-.6VDC	0V	0V	6.3VAC	155VDC	107VDC	0V		
V 11	6AL5	-.1VDC	-.2VDC	6.3VAC	1.5VAC	0V	0V	-.2VDC		
V 12	6AT6	-.7VDC	0V	0V	6.3VAC	-.5VDC	-.5VDC	80VDC		
V 13	6K6GT	6.3VAC	6.3VAC	210VDC	215VDC	-5.9VDC	-17VDC	0V	0V	
V 14	12AU7	147VDC	0V	7.3VDC	6.3VAC	6.3VAC	6.7VDC	0V	1.1VDC	0V
V 15	6SN7GT	#-17VDC	#57VDC #150VDC	#0V	#0V	#320VDC	#9VDC #17VDC	6.3VAC	0V	
V 16	6AL5	0V	0V	6.3VAC	0V	4.5VDC	0V	-3.1VDC		
V 17	6SN7GT	-1.7VDC	85VDC	8.4VDC	.2VDC	200VDC	8.4VDC	6.3VAC	0V	
V 18	6BG6G	0V	6.3VAC	#8.7VDC	0V	#0V	#100VDC	0V	#280VDC	TOP CAP *
V 19	5V4G	0V	325VDC	325VDC	250VDC	0V	250VDC	0V	325VDC	
V 20	1B3GT	* DO NOT MEASURE								
V 21	5U4G	0V	270VDC	0V	390VAC	0V	390VAC	0V	270VDC	
V 22	10BP4	♦160VDC	85VDC	PIN 10 315VDC	PIN 11 232VDC	PIN 12 ♦160VDC				

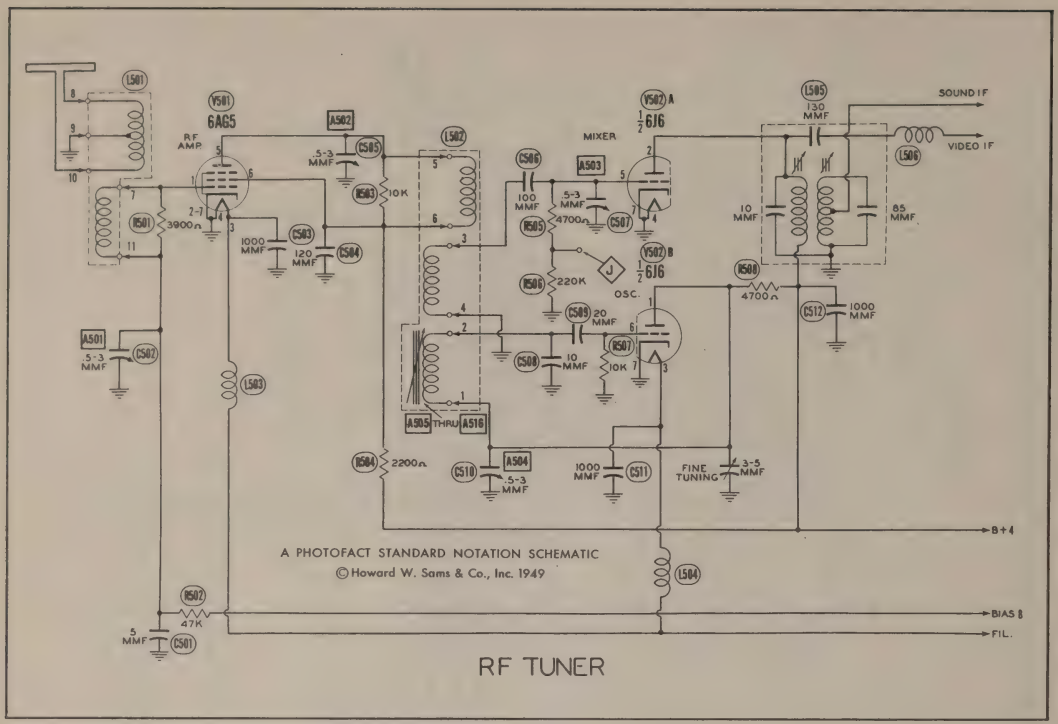
§ Taken with vacuum tube voltmeter.
# Measured from pin 3 of V15.
* Do not measure.
♦ 6.3VAC measured across filament.
Note. Contrast control set at maximum for these measurements.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6J6	†4KΩ	†4KΩ	.1Ω	0Ω	90KΩ	90KΩ	0Ω		
V 2	6J6	†1.5KΩ	†1.5KΩ	.1Ω	0Ω	1 Meg.	1 Meg.	0Ω		
V 3	6J6	†5KΩ	†5KΩ	.1Ω	0Ω	100KΩ	100KΩ	47Ω		
V 4	6AG5	25KΩ	39Ω	0Ω	.1Ω	†1.8KΩ	†1.8KΩ	39Ω		
V 5	6AG5	15KΩ	39Ω	0Ω	.1Ω	†1.8KΩ	†1.8KΩ	39Ω		
V 6	6AG5	10KΩ	150Ω	0Ω	.1Ω	†9.5KΩ	†1.8KΩ	150Ω		
V 7	6AL5	.1Ω	Inf.	.1Ω	0Ω	0Ω	0Ω	4.7KΩ		
V 8	12AU7	†4KΩ	1 Meg.	#47Ω	.1Ω	.1Ω	†3KΩ	1 Meg.	0Ω	0Ω
V 9	6AG5	0Ω	150Ω	.1Ω	0Ω	†1.8KΩ	†1.8KΩ	150Ω		
V 10	6AU6	470KΩ	0Ω	0Ω	.1Ω	†1.8KΩ	†23KΩ	0Ω		
V 11	6AL5	200KΩ	100KΩ	.1Ω	2.1Ω	0Ω	0Ω	100KΩ		
V 12	6AT6	10 Meg.	0Ω	0Ω	.1Ω	85KΩ	85KΩ	†330KΩ		
V 13	6K6GT	.1Ω	.1Ω	†1.5KΩ	†1.2KΩ	470KΩ	150Ω	0Ω	0Ω	
V 14	12AU7	†8KΩ	1 Meg.	4KΩ	.1Ω	.1Ω	47KΩ	0Ω	270KΩ	0Ω
V 15	6SN7GT	2 Meg.	†3 Meg. †1.5Meg.	#0Ω	2.2 Meg.	†1.8KΩ	#5.5KΩ #560Ω	.1Ω	0Ω	
V 16	6AL5	390Ω	390Ω	.1Ω	0Ω	4.8 Meg.	0Ω	4.8 Meg.		
V 17	6SN7GT	150KΩ	†300KΩ	1.8KΩ	5 Meg.	†30KΩ	1.8KΩ	.1Ω	0Ω	
V 18	6BG6G	Inf.	.1Ω	#82Ω	Inf.	1 Meg.	50KΩ	0Ω	†5KΩ	TOP CAP †6KΩ
V 19	5V4G	Inf.	†6KΩ	†6KΩ	†70Ω	Inf.	†70Ω	Inf.	†6KΩ	
V 20	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP †6KΩ
V 21	5U4G	Inf.	1KΩ	Inf.	#23Ω	Inf.	#2Ω	Inf.	1KΩ	
V 22	10BP4	†750Ω	†4KΩ	PIN 10 †60KΩ	PIN 11 †720Ω	PIN 12 †750Ω				

† Measured from pin 8 of V21.
# Measured from pin 3 of V15.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.



RF TUNER

PARTS LIST AND DESCRIPTIONS

TUBES

ITEM No.	USE	REPLACEMENT DATA: STANDARD REPLACEMENT	REPLACEMENT DATA: RMA BASE TYPE	
V501	RF Amp.	6AG5	7BD	
V502	Mixer-Osc.	6J6	7BF	

RESISTORS

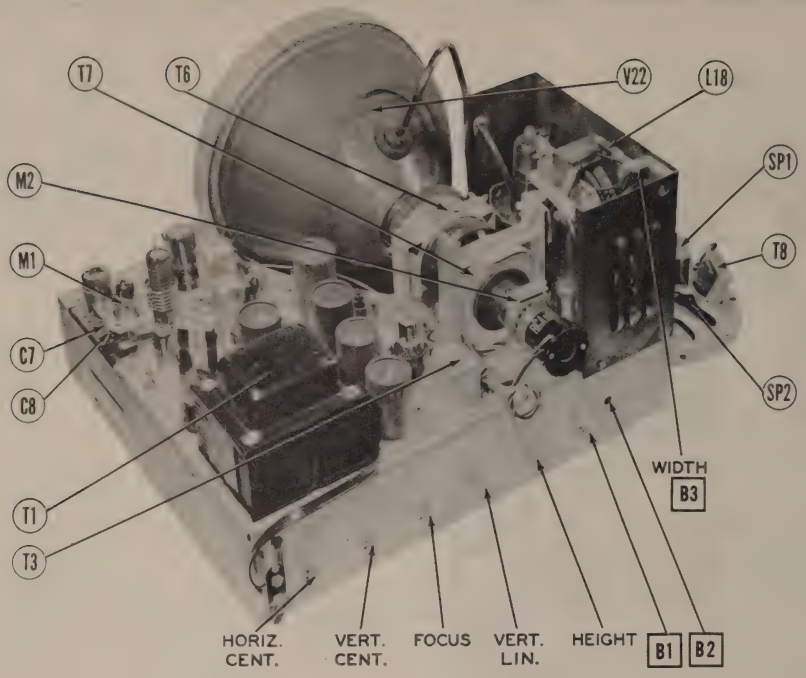
ITEM No.	RATING: RESISTANCE	RATING: WATTS	IDENTIFICATION
R501	3900Ω	1/2	RF Grid Shunt
R502	47KΩ	1/2	RF Grid
R503	10KΩ	1/2	RF Plate Shunt
R504	2200Ω	1/2	RF Decoupling
R505	4700Ω	1/2	Mixer Grid
R506	220KΩ	1/2	Mixer Grid
R507	10KΩ	1/2	Osc. Grid
R508	4700Ω	1/2	Osc. Plate

CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT	IDENTIFICATION
C501	5		Fixed Trimmer
C502	.5-3		RF Trimmer
C503	1,000		Filament Bypass
C504	120		RF Decoupling
C505	.5-3		RF Trimmer
C506	100		RF Coupling
C507	.5-3		RF Trimmer
C508	10		Osc. Feedback
C509	20		Osc. Grid Cap.
C510	.5-3		Osc. Trimmer
C511	1,000		Filament Bypass
C512	1,000		RF Bypass

COILS

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	
L501	Ant. Coil	0Ω	0Ω	Replace in matched pairs only. Each coil is identified with channel number.
L502	Mixer & Osc	0Ω	0Ω	
L503	Fil. Choke	0Ω		
L504	Fil. Choke	0Ω		
L505	IF Trans.	0Ω	.2Ω	
L506	RF Coil	.2Ω		



CHASSIS-TOP VIEW

HORIZONTAL FREQUENCY AND LINEARITY ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Turn the horizontal hold control to the mid-position of its range.

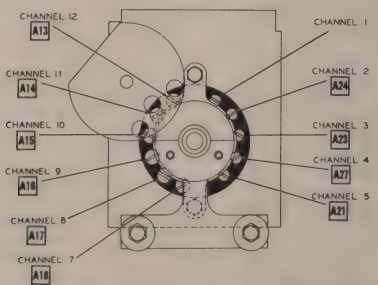
Adjust the horizontal frequency slug (B1) until the picture synchronizes horizontally.

Turn the horizontal drive trimmer (B2) clockwise as far as possible without crowding the right side of the picture.

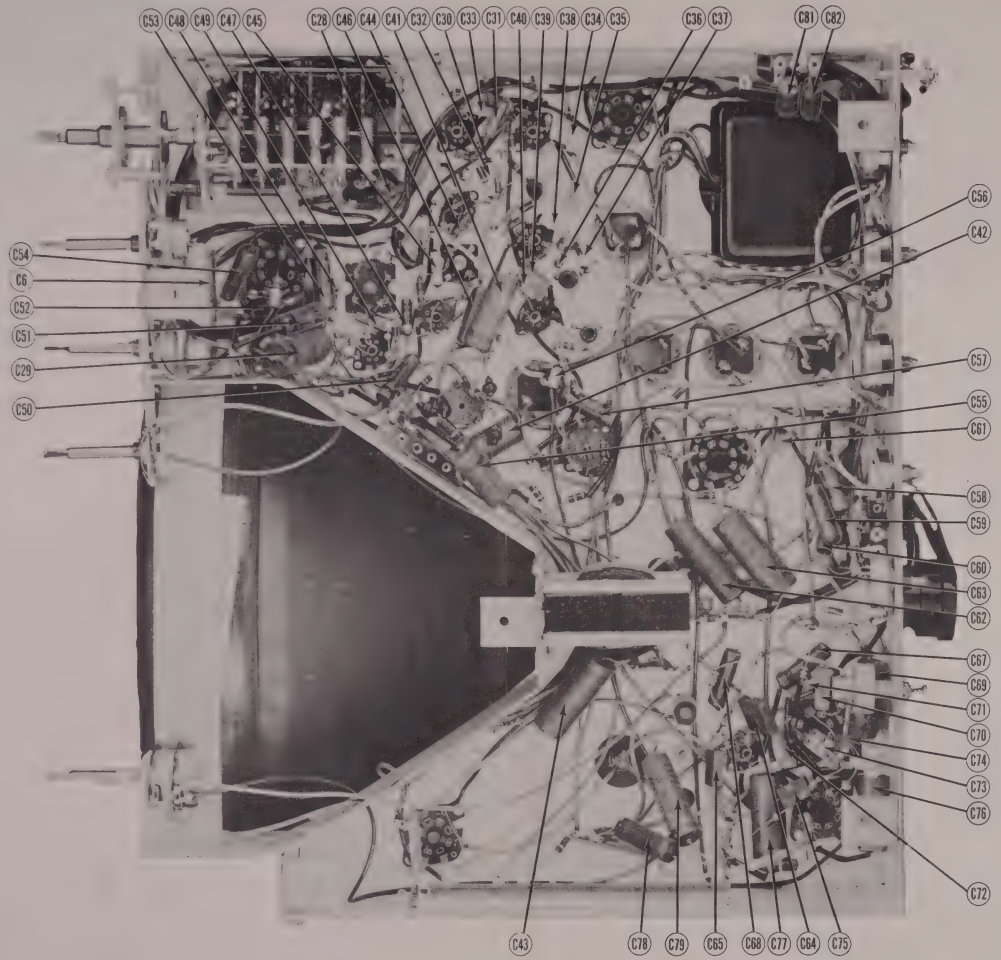
Adjust the width slug (B3) until picture fills the mask horizontally.

Adjust the horizontal linearity slug (B4) until picture is symmetrical from left to right.

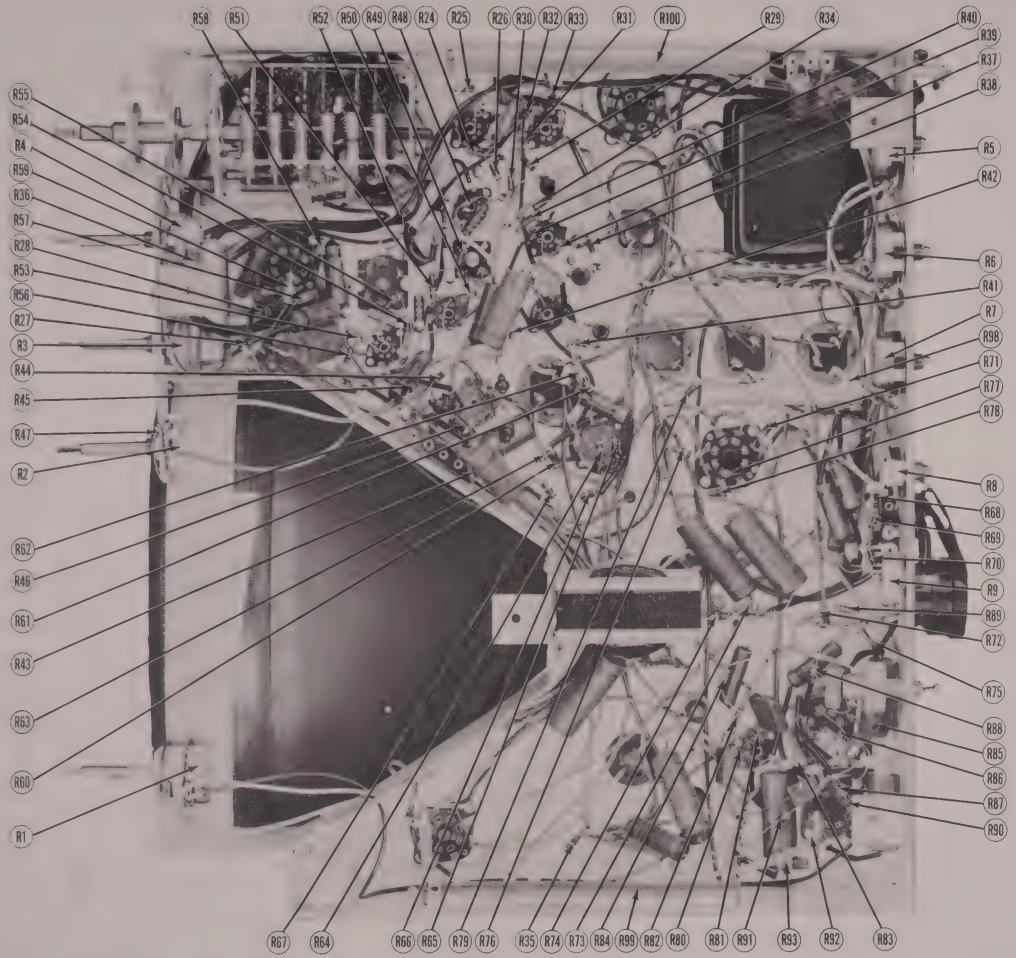
Due to interaction of the controls, it may be necessary to repeat the adjustments of B2, B3 and B4.



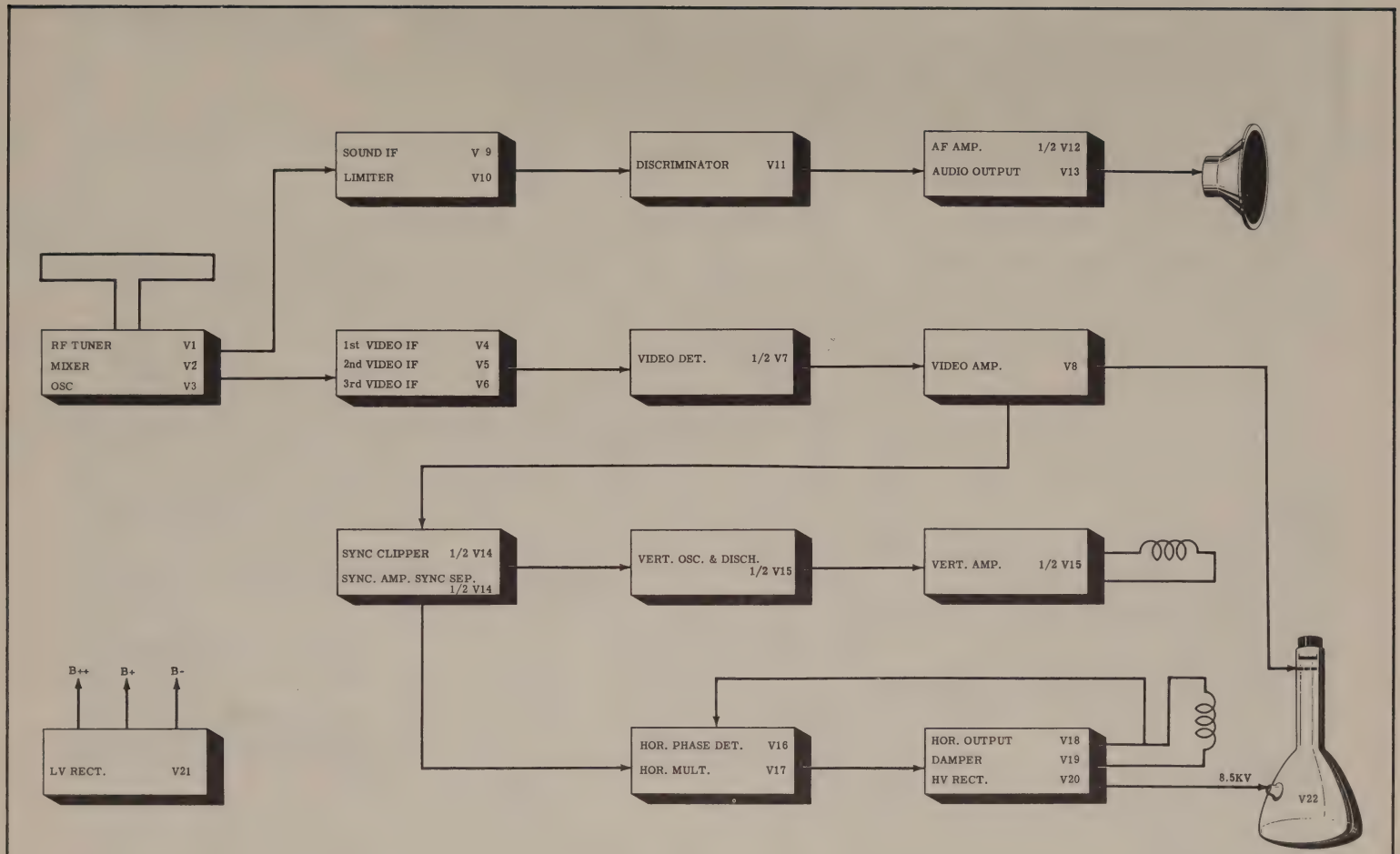
RF OSCILLATOR ALIGNMENT POINTS
(RCA TUNER)



CHASSIS BOTTOM VIEW–CAPACITOR IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



BLOCK DIAGRAM

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1A	RF Amp.	6J6	6J6	7BF	
B	RF Amp.	6AG5	6AG5	7BD	
V2A	Mixer	6J6	6J6	7BF	
B	Converter	6J6	6J6	7BF	
V3	Osc.	6J6	6J6	7BF	
V4	1st Video IF Amp.	6AG5	6AG5	7BD	
V5	2nd Video IF Amp.	6AG5	6AG5	7BD	
V6	3rd Video IF Amp.	6AG5	6AG5	7BD	
V7	Video Det.	6AL5	6AL5	6BT	
V8A	Video Amp.	12AU7	12AU7	9A	
B	Video Amp.	6SN7GT	6SN7GT	8BD	Used in early production.
V9A	Sound IF Amp.	6AG5	6AG5	7BD	
B	Sound IF Amp.	6BA6	6BA6	7BK	
V10	Limiter	6AU6	6AU6	7BK	
V11	Disc.	6AL5	6AL5	6BT	
V12	AF Amp.-Bias Clamper	6AT6	6AT6	7BT	
V13	Audio Output	6K6GT	6K6GT	7S	
V14	Sync. Clipper-Sync. Amp.-Sync. Separator	12AU7	12AU7	9A	
V15	Vert. Osc.-Vert. Disch.-Vert. Amp.	6SN7GT	6SN7GT	8BD	
V16	Hor. Phase Det.	6AL5	6AL5	6BT	
V17	Hor. Mult.	6SN7GT	6SN7GT	8BD	
V18	Hor. Output	6BG6G	6BG6G	5BT	
V19	Damper	5V4G	5V4G	5L	
V20	HV Rectifier	1B3GT	1B3GT	3C	
V21	LV Rectifier	5U4G	5U4G	5T	
V22A	Picture Tube	10BP4	10BP4	12D	Used in models CT-102, CT-103.
B	Picture Tube	12LP4	12LP4	12D	Used in model CT-104.
C	Picture Tube	16AP4	16AP4	12D	Used in models DT-160, DT-161.

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: EIMIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	450		AFH82J	UP9CJ731		TVL-69	▲ Filter ▲ Vert. Output Decoupling
B	10	450						
C2A	40	450		AFH8J8D26B	UP9CJ887		TVL-57	▲ Filter ■ Filter
B	40	150						
C	130	50						▲ Vert. Output Cath. Bypass
C3A	80	450		AFH162J	UP9BJ857		TVL-47	▲ Filter
B	10	450						▲ Decoupling
C4A	250	10		PRS10/250	UP7BJ808		TVL-66	▲ Hor. Cent. Cont. Bypass
B	1000	6		PRS6/1000				▲ Vert. Cent. Cont. Bypass
C5A	10	450		AFH266J	UP8CJ898		TVL-30	▲ Decoupling ■ Filter
B	30	450						▲ Filter
C	30	450						
C6	30	450		PRS450/30	BR3045A		TVA-23	Output Decoupling
C7	10					NPOK-10		Fixed Trimmer
C8	10					NPOK-10		Fixed Trimmer
C9	1500					GP2L-0015		Bias Filter
C10	270					GP2K-270		RF Coupling
C11	270					GP2K-270		RF Coupling
C12	1.5					NPOK-1.5		Neutralizing
C13	1.5					NPOK-1.5		Neutralizing
C14	.68							RF Coupling
C15	4.7					NPOK-4.7		RF Coupling
C16	4.7					NPOK-4.7		RF Coupling
C17	1500					GP2L-0015		RF Decoupling
C18	22					GP1K-22		Fixed Trimmer
C19	1500					GP2L-0015		Decoupling
C20	10					NPOK-10		Fixed Trimmer
C21	4.7					NPOK-4.7		Osc. Feedback
C22	4.7					NPOK-4.7		Osc. Feedback
C23	1500					GP2L-0015		Filament Bypass
C24	1500					GP2L-0015		Mixer Decoupling
C25	68							Fixed Trimmer
C26	1000	500		1464-001	1R5D1		MS-21	Fixed Trimmer *
C27	220	500						Fixed Trimmer *
C28	270	500		1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C29	.25	400		P488-25	GT4P25		TC-2	Bias Filter
C30	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	1st V. IF Decoupling
C31	270	500		1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C32	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	Bias Filter
C33	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	Bias Filter
C34	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	2nd V. IF Decoupling
C35	270	500		1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C36	75			1469-000075		NPOM-75		Fixed Trimmer
C37	100			1468-0001	5W5T1	GP1K-100	1FM-31	3rd V. IF Cath. Bypass
C38	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	3rd V. IF Decoupling
C39	270	500		1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C40	10			1468-00001	5W5Q1	GP1K-10	MS-41	V. Diode Filter
C41	.05	600		P888-05	GT6S5		TM-15	Video Coupling
C42	.05	600		P888-05	GT6S5		TM-15	Video Coupling
C43	.25	400		P488-25	GT4P25		TC-2	Pic. Tube Cath. Decoupling
C44	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	1st S. IF Cath. Bypass
C45	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	1st S. IF Decoupling
C46	.02	600		P688-02	GT6S2		TM-12	Limiter Grid Filter
C47	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	Limiter Screen Bypass
C48	1500			1467-0015	1W5D15	GP2L-0015	1FM-215	Limiter Plate Decoupling
C49	270	500		1468-00025	5W5T25	GP2K-270	1FM-325	RF Bypass
C50	.0025	600		P888-0022	GT6D2	GP2M-0025	TM-22	Audio Coupling
C51	.01	600		P888-01		GP2-335-01	TM-11	Audio Coupling
C52	.0025	600		P888-0022	GT6D2	GP2M-0025	TM-22	De-emphasis
C53	.01	600		P888-01	GT6S1	GP2-335-01	TM-11	Audio Coupling

CAPACITO

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT D: DEWALD PART No.	REPLACEMENT D: AEROVOX PART No.	REPLACEMENT D: CORNEL DUBILIE PART N
C54	.005	600		P688-005	GT6D5
C55	.05	600		P688-05	GT6S5
C56	22			1468-000025	5W5Q25
C57	.01	600		P688-01	GT6S1
C58	.002	600		P688-002	GT6D2
C59	.005	600		P688-005	GT6D5
C60	.005	600		P688-005	GT6D5
C61	4700	500		1467-005	1D5D5
C62	.1	600		P688-1	GT6P1
C63	.25	400		P488-25	GT6P25
C64	1000	500		1468-001	1W5D1
C65	1000	500		1468-001	1W5D1
C66	.01	600		P688-01	GT6S1
C67	.005	600		P688-005	GT6D5
C68	.005	600		P688-005	GT6D5
C69	.05	600		P688-05	GT6S5
C70	4300	500			
C71	330	500		1468-00035	5W5T3
C72	390	500		1468-0004	5W5T4
C73	270	500		1468-00025	5W5T25
C74	100	500		1468-0001	5W5T1
C75	18	1500			
C76	.05	600		P688-05	GT6S5
C77	.25	400		P488-25	GT4P25
C78	.035	600		P688-033	
C79	.1	600		P688-1	GT6P1
C80	500	10000			
C81	.01	600		P688-01	GT6S1
C82	.01	600		P688-01	GT6S1

* Not used in all models.
† Some models use .005MFD in this application.
‡ Some models use 4300MMF in this application.

CON

ITEM No.	RATING: RESIST-ANCE	RATING: WATTS	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLARC PART
R1A	1 Meg.	½		B11-137 *	3034A
B	50KΩ	½		B11-123 *	
C	Shaft End			E187 *	
R2A	500KΩ	½		Q11-133	AM-58
B	Shaft			Not Req.	KSS-3
R3A	10KΩ	½			AM-30
B	Shaft				KSS-3
R4A	1 Meg.	½		Q13-137	AM-63
B	Shaft			Not Req.	KSS-3
C	Switch			76-1	SW-A
R5	20Ω	2		W-20	43-20
R6	20Ω	2		W-20X10	43-20C
R7	1500Ω	2		W-1600	10-1500
R8	5000Ω	½		Q11-114	M-19-S
R9	2.5Meg.	½		Q11-239	M-84-S

* Additional parts to be used with "Concentrikit".

RESI

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: IRC PART No.
R10	150Ω	½		
R11	150Ω	½		
R12	10000Ω 20%	½		BTS-1000
R13	47000Ω 20%	½		BTS-4700
R14	47000Ω 20%	½		BTS-4700
R15	10000Ω 20%	½		BTS-1000
R16	1 Meg.	½		
R17	10KΩ	½		BTS-10K
R18	10000Ω 20%	½		BTS-1000
R19	150Ω 20%	½		
R20	47000Ω 20%	½		BTS-4700
R21	47Ω 20%	½		
R22	100KΩ 20%	½		
R23	100KΩ 20%	½		
R24	15KΩ	½		
R25	39Ω	½		
R26	1000Ω	½		BTS-1000
R27	6.8 Meg.	½		BTS-6.8 Meg.
R28	82KΩ	½		BTS-82K
R29	10KΩ	½		BTS-10K
R30	12KΩ	½		BTS-12K
R31	1000Ω	½		BTS-1000
R32	5600Ω	½		
R33	39Ω	½		
R34	1000Ω	½		BTS-1000
R35	3300Ω	½		BTS-3300
R36	1000Ω	½		BTS-1000
R37	10KΩ	½		
R38	150Ω	½		
R39	6800Ω	½		
R40	1000Ω	½		BTS-1000
R41	4700Ω	½		BTS-4700
R42	1 Meg.	½		BTS-1 Meg.
R43	2200Ω	½		BTS-2200
R44	47Ω	½		BW-½-47
R45	1 Meg.	½		BTS-1 Meg.
R46	3300Ω	1		BTA-3300
R47	100KΩ	½		BTS-100K
R48	150Ω	½		
R49	1000Ω	½		BTS-1000
R50	470KΩ	½		
R51	22KΩ	½		

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No	USE	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1A	RF Amp.	616	6T8	7BF	
B	RF Amp.	6AG5	6AG5	7BD	
V2A	Mixer	6J6	6J6	7BF	
B	Converter	6J6	6T8	7BF	
V3	Osc.	6J6	6J6	7BF	
V4	1st Video IF Amp.	6AG5	6AG5	7BD	
V5	2nd Video IF Amp.	6AG5	6AG5	7BD	
V6	3rd Video IF Amp.	6AG5	6AG5	7BD	
V7	Video Det.	6AL5	6AL5	6BT	
V8A	Video Amp.	12AU7	12AU7	9A	
B	Video Amp.	6S8NGT	6S8NGT	8BD	Used in early production.
V9A	Sound IF Amp.	6AG5	6AG5	7BD	
B	Sound IF Amp.	6BA6	6BA6	7BK	
V10	Limiter	6AU6	6AU6	7BK	
V11	Disc.	6AL5	6AL5	6BT	
V12	AF Amp. -Bias Clamper	6AT6	6AT6	7BT	
V13	Audio Output	6K8GT	6K8GT	7S	
V14	Sync. Clipper- Sync. Amp. -Sync. Separator	12AU7	12AU7	9A	
V15	Vert. Osc. - Vert. Disch. - Vert. Amp.	6SN7GT	6SN7GT	8BD	
V16	Hor. Phase Det.	6AL5	6AL5	6BT	
V17	Hor. Mult.	6SN7GT	6SN7GT	9BD	
V18	Hor. Output	6BG6G	6BG6G	5BT	
V19	Damper	5V4G	5V4G	5L	
V20	HV Rectifier	1B3GT	1B3GT	3C	
V21	LV Rectifier	5U4G	5U4G	5T	
V22A	Picture Tube	10BP4	10BP4	12D	Used in models CT-102, CT-103.
B	Picture Tube	12LP4	12LP4	12D	Used in model CT-104.
C	Picture Tube	16AP4	16AP4	12D	Used in models DT-160, DT-161.

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	450		AFH82J	UP9C2T31		TVL-69	▲ Filter
B	20	450						▲ Vert. Output Decoupling
C2A	40	450		AFH82JD26B	UP9C2887		TVL-57	▲ Filter
B	40	150						▲ Filter
C	130	50						▲ Vert. Output Cath. Bypass
C3A	80	450		AFH82J	UP9B2857		TVL-47	▲ Filter
B	20	450						▲ Decoupling
C4A	250	10		PRS10/250	UP7BJ808		TVL-56	■ Hor. Cent. Cont. Bypass
B	300	6		PRS8/1000				■ Vert. Cent. Cont. Bypass
C5A	20	450		AFH286J	UP8C3898		TVL-30	▲ Decoupling
B	20	450						■ Filter
C	20	450						▲ Filter
C6	30	450		PRS450/30	BR3045A		TVA-23	Output Decoupling
C7	30					NPOK-10		Fixed Trimmer
C8	20					NPOK-10		Fixed Trimmer
C9	1500					GP2L-0015		Bias Filter
C10	270					GP2K-270		RF Coupling
C11	270					GP2K-270		RF Coupling
C12	1.5					NPOK-1.5		Neutralizing
C13	1.5					NPOK-1.5		Neutralizing
C14	68							RF Coupling
C15	4.7					NPOK-4.7		RF Coupling
C16	4.7					NPOK-4.7		RF Coupling
C17	1500					GP2L-0015		RF Decoupling
C18	22					GP2K-22		Fixed Trimmer
C19	1500					GP2L-0015		Decoupling
C20	20					NPOK-10		Fixed Trimmer
C21	4.7					NPOK-4.7		Osc. Feedback
C22	4.7					NPOK-4.7		Osc. Feedback
C23	1500					GP2L-0015		Filament Bypass
C24	1500					GP2L-0015		Mixer Decoupling
C25	68							Fixed Trimmer
C26	3000	500		1464-001	IRSD1		MS-31	Fixed Trimmer *
C27	220	500						Fixed Trimmer *
C28	230	500		1468-00025	SW5T25	GP2K-270	1FM-325	IF Coupling
C29	25			P488-25		CT4P25	TC-2	Bias Filter
C30	1500			1467-0015	IW5D15	GP2L-0015	1FM-215	1st V. IF Decoupling
C31	270	500		1466-00025	SW5T25	GP2K-270	1FM-325	IF Coupling
C32	1500			1467-0015	IW5D15	GP2L-0015	1FM-215	Bias Filter
C33	1500			1467-0015	IW5D15	GP21-0015	1FM-215	Bias Filter -
C34	1500			1467-0015	IW5D15	GP2L-0015	1FM-215	2nd V. IF Decoupling
C35	270	500		1468-00025	SW5T25	GP2K-270	1FM-325	IF Coupling
C36	75			1469-000075		NPOM-75		Fixed Trimmer
C37	100			1468-0001	SW5T1	GP1K-100	1FM-31	3rd V. IF Cath. Bypass
C38	1500			1467-0015	IW5D15	GP2L-0015	1FM-315	3rd V. IF Decoupling
C39	270	500		1468-00025	SW5T25	GP2K-270	1FM-325	IF Coupling
C40	10			1468-00001	SW5Q1	GP1K-10	MS-41	V. Diode Filter
C41	.05	600		P688-05	GT6S5		TM-15	Video Coupling
C42	.05	600		P688-05	GT6S5		TM-15	Video Coupling
C43	25	400		P488-25	GT4P25		TC-2	Plic. Tube Cath. Decoupling
C44	1500			1467-0015	IW5D15	GP2L-0015	1FM-215	1st S. IF Cath. Bypass
C45	1500			1467-0015	IW5D15	GP2L-0015	1FM-315	1st S. IF Decoupling
C46	.02	600		P688-02	GT6S2		TM-12	Limiter Grid Filter
C47	1500			1467-0015	IW5D15	GP2L-0015	1FM-215	Limiter Screen Bypass
C48	1500			1467-0015	IW5D15	GP2L-0015	1FM-215	Limiter Plate Decoupling
C49	270	500		1468-00025	SW5T25	GP2K-270	1FM-325	RF Bypass
C50	.0025	600		P688-0022	GT6D2	GP2M-0025	TM-22	Audio Coupling
C51	.01	600		P688-01		GP2-335-01	TM-11	Audio Coupling
C52	.0025	600		P688-0022	GT6D2	GP2M-0025	TM-22	De-emphasis
C53	.01	600		P688-01	GT6S1	GP2-335-01	TM-11	Audio Coupling

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C54	.005	600		P688-005	GT6D5	GP2M-005	TM-25	Output Plate Bypass
C55	.05	600		P688-05	GT6S5		TM-15	Sync. Coupling
C56	22			1468-000025	SW5Q25	GP1K-22	MS-425	Sync. Clipper Plate Bypass
C57	.01	600		P688-01	GT6S1	GP2-335-01	TM-11	Sync. Coupling
C58	.002	600		P688-002	GT6D2	GP2M-002	TM-22	Integrator Net.
C59	.005	600		P688-005	GT6D5	GP2M-005	TM-25	Integrator Net.
C60	.005	600		P688-005	GT6D5	GP2M-005	TM-25	Integrator Net.
C61	4700	500		1467-005	IS5D5	GP2M-0047	1FM-25	Vert. Osc. Grid Cap.
C62	.1	600		P688-1	GT6P1		TM-1	Vert. Discharge
C63	.25	400		P488-25	GT6P25		TC-2	Vert. Sweep Coupling
C64	1000	500		1468-001	IW5D1	GP2L-001	1FM-21	Hor. Sync. Coupling
C65	1000	500		1468-001	IW5D1	GP2L-001	1FM-21	Hor. Sync. Coupling
C66	.01	600		P688-01	GT6S1	GP2-335-01	TM-11	AFC Filter *
C67	.005	600		P688-005	GT6D5	GP2M-005	TM-25	Hor. Feedback †
C68	.005	600		P688-005	GT6D5	GP2M-005	TM-25	AFC Coupling
C69	.05	600		P688-05	GT6S5		TM-15	AFC Filter
C70	4300	500						Fixed Trimmer †
C71	330	500		1468-00035	SW5T3	GP2K-330	1FM-335	Hor. MV Feedback
C72	390	500		1468-0004	SW5T4	GP2K-390	1FM-34	Hor. Discharge
C73	270	500		1468-00025	SW5T25	GP2K-270	1FM-325	Hor. Sweep Coupling
C74	100	500		1468-0001	SW5T1	GP1K-100	1FM-31	Voltage Divider *
C75	18	1500						Hor. Feedback
C76	.05	600		P688-05	GT6S5		TM-15	Hor. Output Screen Bypass
C77	.25	400		P488-25	GT4P25		TC-2	Hor. Output Cath. Bypass
C78	.035	600		P688-033				Damper Filter
C79	.1	600		P688-1	GT6P1		TM-1	Damper Filter
C80	500	1000						HV Filter
C81	.01	600		P688-01	GT6S1		TM-11	Line Filter
C82	.01	600		P688-01	GT6S1		TM-11	Line Filter

* Not used in all models.
† Some models use .005MFD in this application.
† Some models use 4300MMF in this application.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½		B1J-137 *	3034A	Vert. hold control, panel (Dual Concentric)
B	50KΩ	½		B1J-123 *		Horiz. hold control, rear
C	Shaft End			E187 *		Attach per instructions in "Concentrikit".
R2A	500KΩ	½		Q1J-133	AM-58-3	Brightness Control
B	Shaft			Not Req.	KS8-3	Attach to R2A per instructions
R3A	10KΩ	½			AM-30-V	Contrast control
B	Shaft				KS8-3	Attach to R3A per instructions
R4A	1 Meg.	½		Q3-137	AM-63-Z	Volume control
B	Shaft			Not Req.	KS8-3	Attach to R4A per instructions
C	Switch			76-1	SW-A	Attach to R4A per instructions
R5	30Ω	2		W-30	43-20	Horiz. centering control, Wire Wound
R6	30Ω	2		W-30X10	43-30CT	Vert. centering control, tapped at 10Ω, Wire Wound
R7	1500Ω	2		W-1500	10-1500	Focus control, Wire Wound
R8	500KΩ	½		Q1J-114	M-19-S	Vert. linearity control
R9	2.5 Meg.	½		Q1J-239	M-84-S	Height control

* Additional parts to be used with "Concentrikit".

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES: ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED.
R10	150Ω	½			RF Grid
R11	150Ω	½			RF Grid
R12	1000Ω 20%	½		BTS-1000	Bias Filter
R13	4700Ω 20%	½		BTS-4700	RF Plate
R14	4700Ω 20%	½		BTS-4700	RF Plate
R15	1000Ω 20%	½		BTS-1000	RF Decoupling
R16	1 Meg.	½			Mixer Grid
R17	10KΩ	½		BTS-10K	Mixer Grid Shunt
R18	1000Ω 20%	½		BTS-1000	Mixer Decoupling
R19	150Ω 20%	½			Decoupling
R20	4700Ω 20%	½		BTS-4700	Osc. Plate
R21	47Ω 20%	½			Osc. Cathode
R22	100KΩ 20%	½			Osc. Grid
R23	100KΩ 20%	½			Osc. Grid
R24	18KΩ	½			1st Video IF Grid
R25	39Ω	½			1st Video IF Cathode
R26	1000Ω	½		BTS-1000	1st Video IF Decoupling
R27	6.8 Meg.	½		BTS-6.8 Meg.	Video Divider
R28	82KΩ	½		BTS-82K	Bias Network
R29	10KΩ	½		BTS-10K	Bias Network
R30	12KΩ	½		BTS-12K	Voltage Divider
R31	1000Ω	½		BTS-1000	Bias Network
R32	5600Ω	½			2nd Video IF Grid
R33	39Ω	½			2nd Video IF Cathode
R34	1000Ω	½		BTS-1000	2nd Video IF Decoupling
R35	3300Ω	½		BTS-3300	Bias Voltage Divider
R36	1000Ω	½		BTS-1000	Voltage Divider
R37	10KΩ	½			3rd Video IF Grid
R38	150Ω	½			3rd Video IF Cathode
R39	6800Ω	½			3rd VideoIF Plate
R40	1000Ω	½		BTS-1000	3rd Video IF Decoupling
R41	4700Ω	½		BTS-4700	Video Det. Diode Load
R42	1 Meg.	½		BTS-1 Meg.	Video Amp. Grid
R43	2200Ω	½		BTS-2200	Video Amp. Plate
R44	47Ω	½		BW-1-47	Video Amp. Cathode
R45	1 Meg.	½		BTS-1 Meg.	Video Amp. Grid
R46	3300Ω	1		BTA-3300	Video Amp. Plate
R47	100KΩ	½		BTS-100K	Voltage Divider
R48	150Ω	½			1st Sound IF Cathode See Note 1
R49	1000Ω	½		BTS-1000	1st Sound IF Decoupling See Note 2
R50	470KΩ	½			Limiter Grid
R51	22KΩ	½			Limiter Screen

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R52	1000Ω	½		BTS-1000	Limiter Plate Decoupling
R53	5Ω	½		BW-½-4.7	Disc. Filament, Wire Wound
R54	100KΩ	½		BTS-100K	Disc. Diode Load
R55	100KΩ	½		BTS-100K	Disc. Diode Load
R56	10 Meg. 20%	½		BTS-10 Meg.	AF Grid
R57	330KΩ	½		BTS-330K	AF Plate
R58	470KΩ	½		BTS-470K	Output Grid
R59	1000Ω	1		BTA-1000	Filter
R60	2200Ω	½		BTS-2200	Picture Tube Grid
R61	270KΩ	½		BTS-270K	DC Rest. Load
R62	47KΩ	½		BTS-47K	Voltage Divider
R63	820KΩ	½		BTS-820K	Sync. Clipper Plate
R64	390Ω	½		BTS-3900	Sync. Amp. Cathode
R65	1 Meg.	½		BTS-1 Meg.	Sync. Amp. Grid
R66	3900Ω	½		BTS-3900	Sync. Amp. Plate
R67	3900Ω	½		BTS-3900	Sync. Amp. Plate
R68	22KΩ	½		BTS-22K	Integrator
R69	8200Ω	½		BTS-8200	Integrator
R70	8200Ω	½		BTS-8200	Integrator
R71	1 Meg.	½		BTS-1 Meg.	Vert. Osc. Grid
R72	1.5 Meg.	½		BTS-1.5 Meg.	Vert. Osc. Plate
R73	6.8 Meg.	½		BTS-6.8 Meg.	Voltage Divider
R74	100KΩ	½		BTS-100K	Voltage Divider
R75	56KΩ	½		BTS-56K	Filter
R76	560Ω	½		BTS-560	Vert. Output Cathode
R77	2.2 Meg.	½		BTS-2.2 Meg.	Vert. Output Grid
R78	330KΩ	½		BTS-330K	Vert. Peaking
R79	1000Ω	½		BTS-1000	Vert. Output Plate Decoupling
R80	100KΩ	½		BTS-100K	Horiz. Phase Det. Load
R81	100KΩ	½		BTS-100K	Horiz. Phase Det. Load
R82	4.7 Meg.	½		BTS-4.7 Meg.	Horiz. Phase Det. Load
R83	390Ω 20%	1		BTA-390	Feedback Network See Note 3
R84	470KΩ	½		BTS-470K	Horiz. AFC Filter Network
R85	5600Ω	½		BTS-5600	Horiz. Osc. Plate
R86	180Ω	½		BTS-180	Horiz. Osc. Cathode
R87	100KΩ	½		BTS-100K	Horiz. Discharge Grid
R88	270KΩ	½		BTS-270K	Horiz. Discharge Plate
R89	22KΩ	½		BTS-22K	Filter
R90	68Ω	½			Parasitic Supp.
R91	1 Meg.	½		BTS-1 Meg.	Horiz. Output Grid
R92	82Ω	2		BW-2-82	Horiz. Output Cathode, Wire Wound
R93	4700Ω	1		BTA-4700	Horiz. Output Screen
R94	4700Ω	½		BTS-4700	Feedback Network See Note 4
R95	6000Ω	50		EP-8000	Damper Filter, Wire Wound
R96	3.3Ω	1			HV Rect. Filament, Wire Wound
R97	1 Meg.	½			HV Filter
R98	270Ω	1		BW-1-270	Focus Coil Shunt, Wire Wound
R99A	400Ω	20			Bias Network, Wire Wound
B	250Ω	1		BW-1-33	Bias Network, Wire Wound
C	100Ω	2		BW-2-100	Bias Network, Wire Wound
D	25Ω	1		BW-1-25	Voltage Divider, Wire Wound
R100A	550Ω	20		DG-500	Filter, Wire Wound
B	10KΩ	20		DG-10K	Bleeder, Wire Wound

Note 1. Some models use 82Ω resistor in this application.
Note 2. Some models use 1500Ω resistor in this application.
Note 3. Some models use 27KΩ resistor in this application.
Note 4. Not used in all models.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.
T1	117VAC at 2.1A	730VCT 280ADC	5VAC at 3A	6.3VAC at 7A SEC. 4 6.3VAC at 6A	P-8153 §		P-3059	TP-355

§ Drill new mounting holes.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC.	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	NOTES
T2	105Ω						
T3	160Ω	1350Ω		A-8121	A-4000	TBO-1	Hor. Sync. Coil
T4	440Ω	SEC. 1 7.5Ω Tap at 7Ω		A-8117		TFB-1	Vert. Block Osc. Trans. Hor. Output Trans.
	Tap at 18Ω	SEC. 2 9Ω					
T5	310Ω	6.2Ω		A-8116	A-3035	TSO-4	Vert. Output Trans.
T6A	13.5Ω			DY-1			Hor. Deflection Coil
B	62Ω						Vert. Deflection Coil
T7	220Ω			FC-10			Focus Coil

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: DEWALD PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
T8	7.1KΩ	3.4Ω	450Ω	.4Ω		A-8114	A-2931	RO-13	

PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

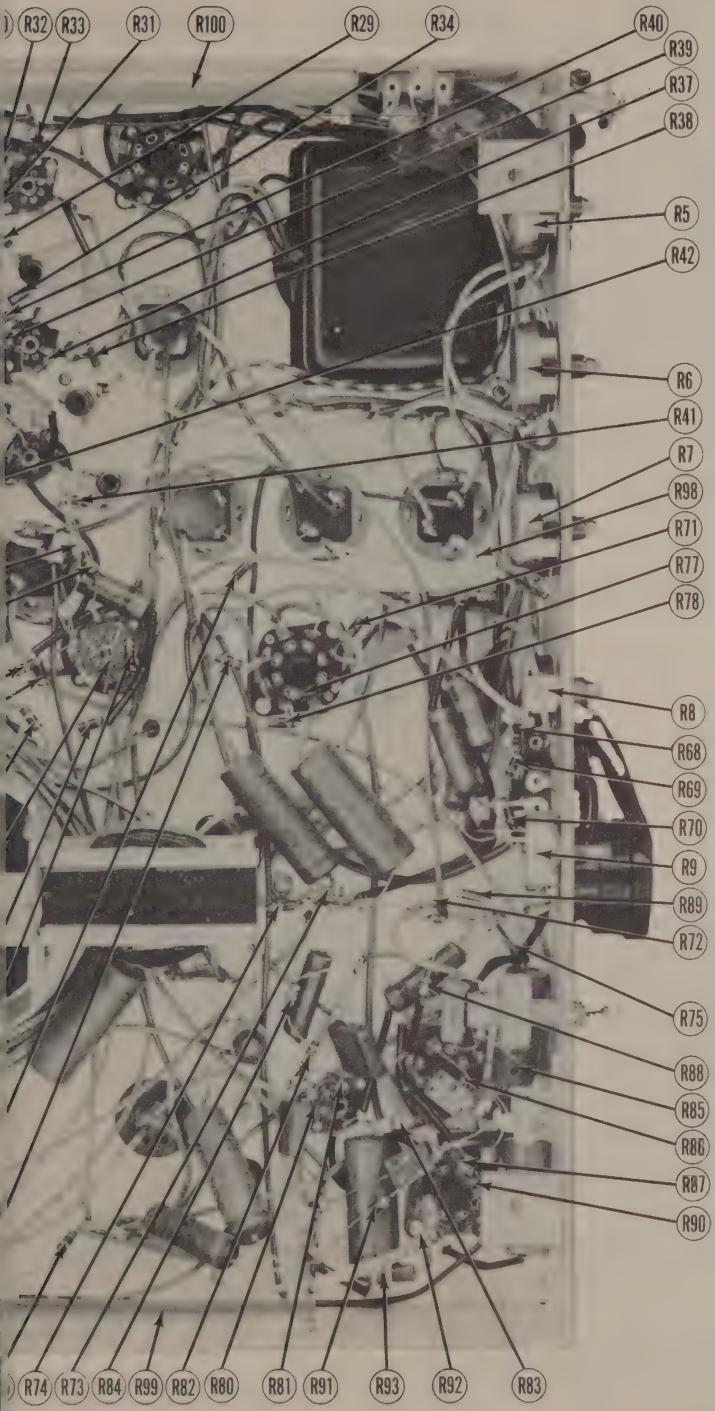
ITEM No.	RATINGS		REPLACEMENT DATA			NOTES
	FIELD RES.	V. C. IMP.	DEWALD PART No.	JENSEN PART No.	QUAM PART No.	
SP1	62Ω	3.4Ω			6E#	# Supplied on order. Specify field current and resistance.
	CONE DIA.	V. C. DIA.				
SP2	6"	3/4"				

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA		NOTES
		PRI.	SEC.	DEWALD PART No.	MEISSNER PART No.	
L1	Ant. Input	0Ω				
L2	Interference Trap	0Ω				
L3	Interference Trap	0Ω				
L4	Fil. Choke	0Ω				
L5	Mixer Grid Trap	0Ω				
L6	1st Video IF and Sound Trap	.2Ω	0Ω			
L7	2nd Video IF	.1Ω				
L8	3rd Video IF	.1Ω				
L9	Sound Trap	0Ω	0Ω			
L10	4th Video IF	.1Ω				
L11	Peaking	2.2Ω				36 Microhenries
L12	Peaking	4.7Ω				120 Microhenries. Wound on 22KΩ resistor.
L13	Peaking	2.2Ω				36 Microhenries
L14	Peaking	4.7Ω				120 Microhenries. Wound on 22KΩ resistor.
L15	Peaking	4.7Ω				120 Microhenries. Wound on 22KΩ resistor.
L16	Sound IF	0Ω	0Ω			
L17	Disc. Trans.	0Ω	0Ω			
L18	Width Cont.	.1Ω				
L19	Hor. Linearity	36Ω				

MISCELLANEOUS

ITEM No.	PART NAME	DEWALD PART No.	NOTES
M1	RF Tuner		
M2	Ion Trap		Permanent magnet type.
M3	Fuse		Type GJV .2A
M4	Fuse		Not used in all models.
	Trimmer		Hor. drive (25-280MMF)



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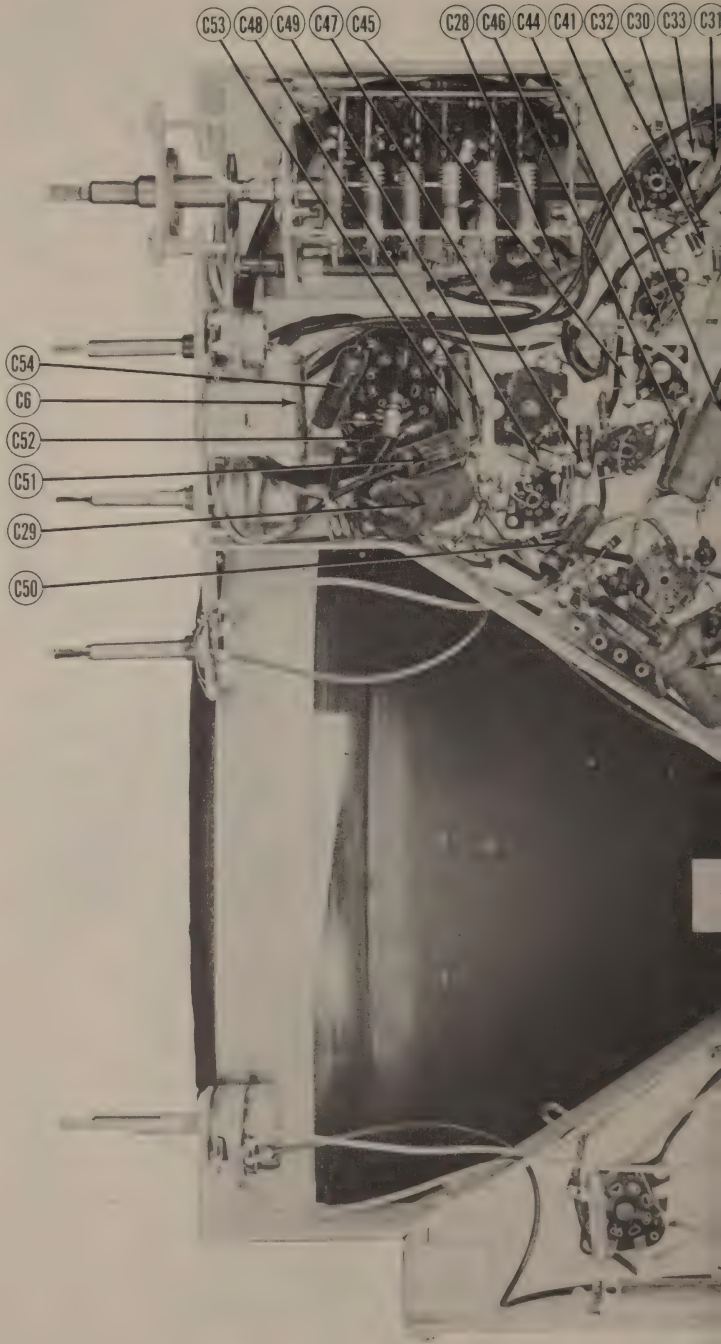

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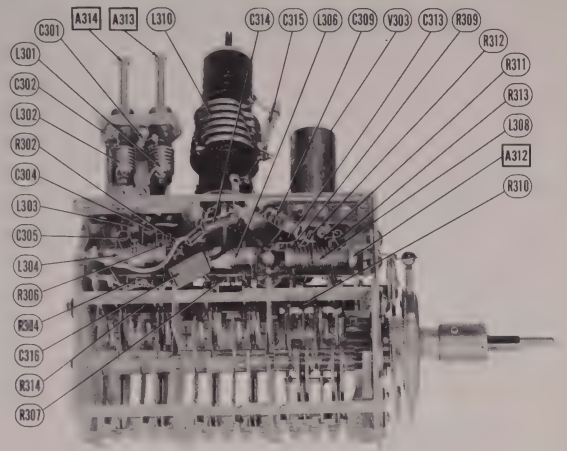
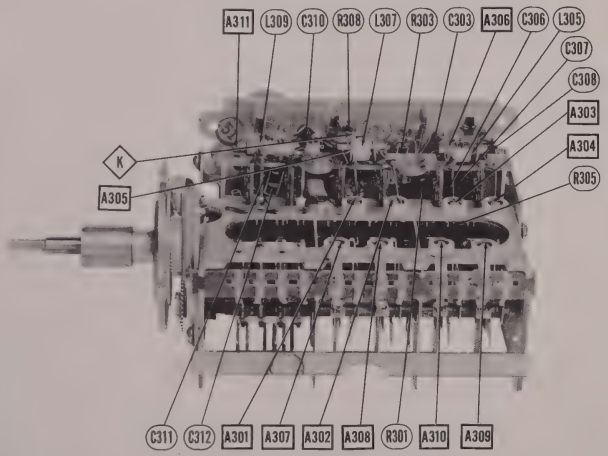
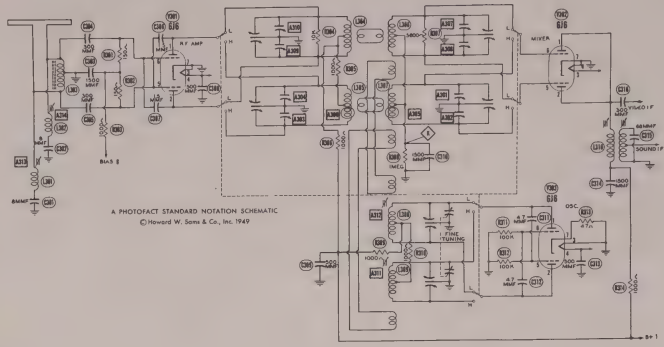


RF TUNER-LEFT SIDE



RF TUNER-RIGHT SIDE



RF TUNER

PARTS LIST AND DESCRIPTIONS

TUBES

ITEM No.	USE	REPLACEMENT DATA STANDARD REPLACEMENT	RMA BASE TYPE
V301	RF Amp.	6J6	7BF
V302	Mixer	6J6	7BF
V303	Oscillator	6J6	7BF

CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT	IDENTIFICATION
C301	8		Fixed Trimmer
C302	8		Fixed Trimmer
C303	1500		Bias Filter
C304	300		RF Coupling
C305	300		RF Coupling
C306	1.5		Neutralizing
C307	1.5		Neutralizing
C308	500		Filament Bypass
C309	500		RF Bypass
C310	1500		Mixer Grid Filter
C311	4.7		Osc. Feedback
C312	4.7		Osc. Feedback
C313	500		Filament Bypass
C314	1500		Mixer Decoupling
C315	68		Fixed Trimmer
C316	300		IF Coupling

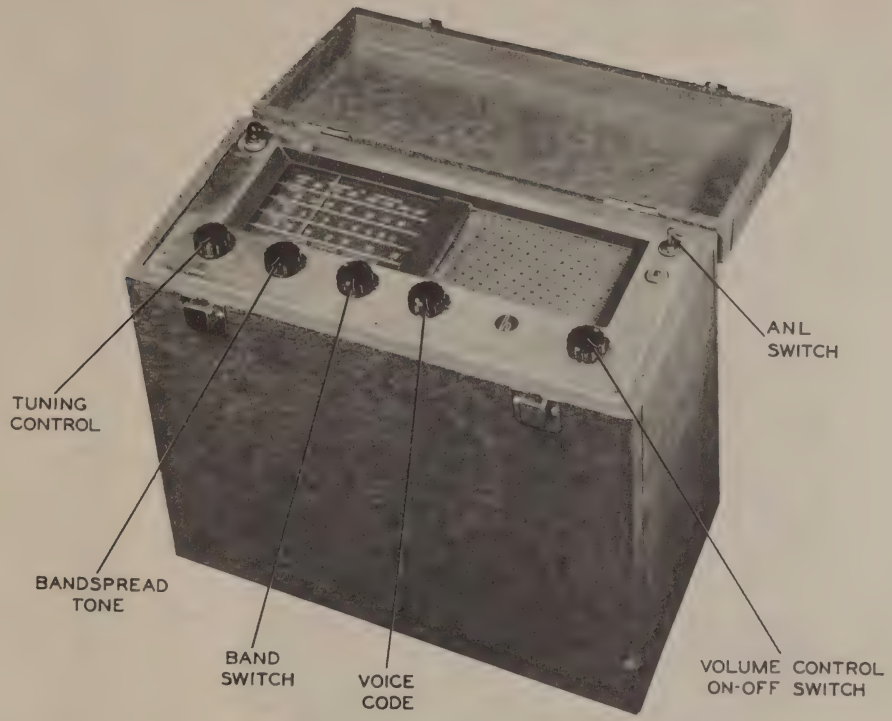
RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	IDENTIFICATION
R301	150Ω	½	RF Grid
R302	150Ω	½	RF Grid
R303	100Ω	½	Bias Filter
R304	10KΩ	½	RF Coil Shunt
R305	100Ω	½	RF Plate
R306	100Ω	½	RF Plate
R307	56Ω	½	Mixer Coil Shunt
R308	1 Meg	½	Mixer Grid
R309	100Ω	½	Osc. Plate
R310	100Ω	½	Osc. Plate
R311	100KΩ	½	Osc. Grid
R312	100KΩ	½	Osc. Grid
R313	47Ω	½	Osc. Cathode
R314	100Ω	½	Mixer Decoup.

COILS

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	
L301	Interference Trap	.02		
L302	Interference Trap	.02		
L303	Ant. Input	.02		
L304	RF Low Band	.02		
L305	RF High Band	.02		
L306	Mixer Low Band	.02		
L307	Mixer High Band	.02		
L308	Osc. Low Band	.02		
L309	Osc. High Band	.02		
L310	IF Trans.	.22	.02	

HALLICRAFTERS
MODEL S-72



HALLICRAFTERS
MODEL S-72

HALLICRAFTERS MODEL S-72

TRADE NAME	Hallicrafters, Model S-72
MANUFACTURER	The Hallicrafters Co., 5th and Kostner Avenues, Chicago 24, Illinois
TYPE SET	Three Power Operated Portable Multi-Band Superheterodyne Receiver with Loop Antenna
TUBES(EIGHT)	Types 1T4 RF Amp., 1U4 Mixer, 1R5 Oscillator, 1U4 1st IF Amp., 1U4 2nd IF Amp., 1U5 DET-AFC-AF, 1U5 BFO, 3V4 Power Output
POWER SUPPLY	105-125 Volts AC-DC or 7.5 Volts "A" Supply and 90 Volts "B" Supply in Pack Form
RATING	.37 Amp. at 117 Volts AC or 110MA at 7.5 Volts DC and 30MA at 90 Volts DC
TUNING RANGE-BROADCAST	550-1600KC SHORT WAVE (#1)1.5-4.4MC, (#2)4.5-11.5MC, (#3)11-30MC

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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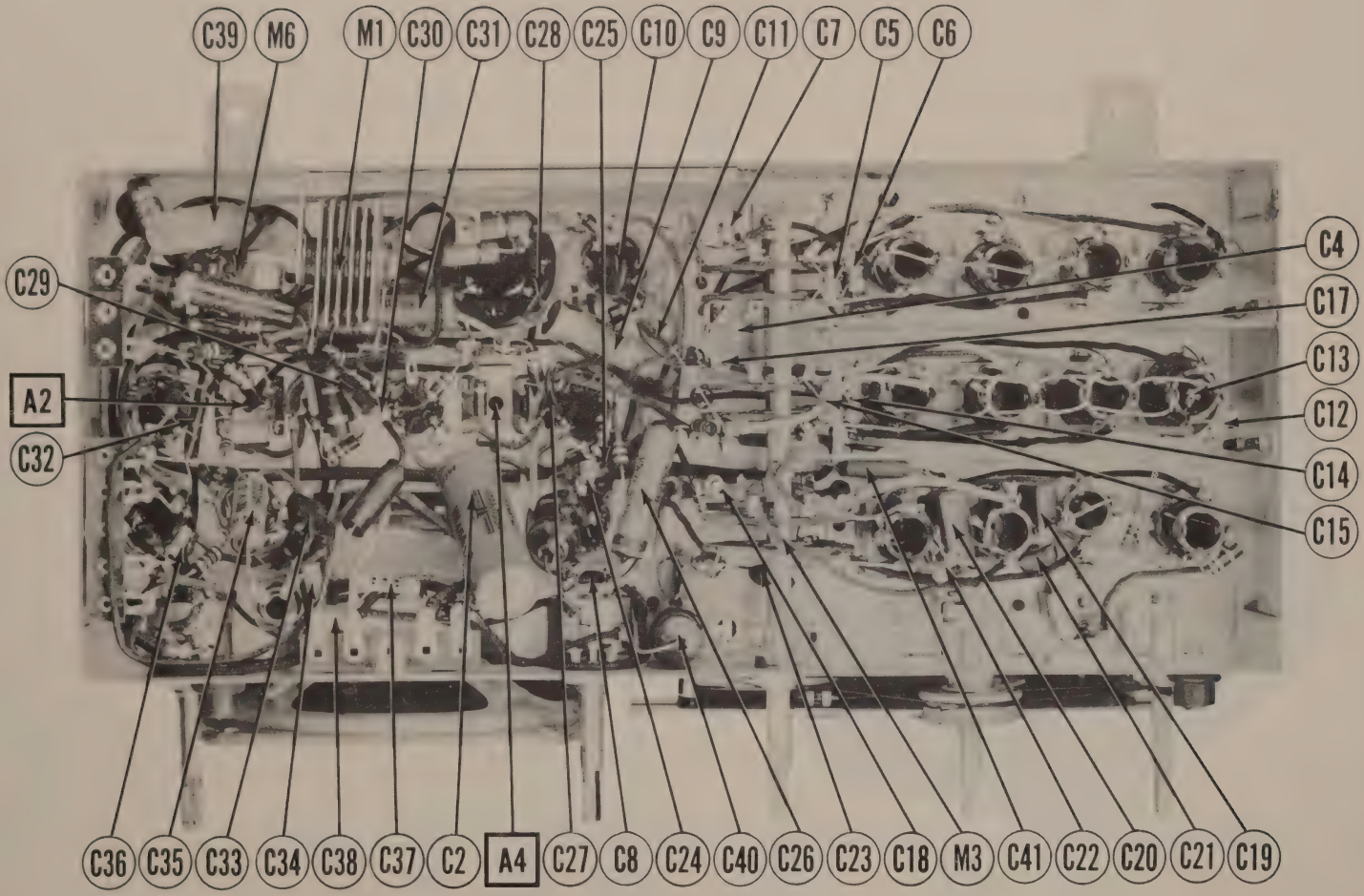
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M1
C30
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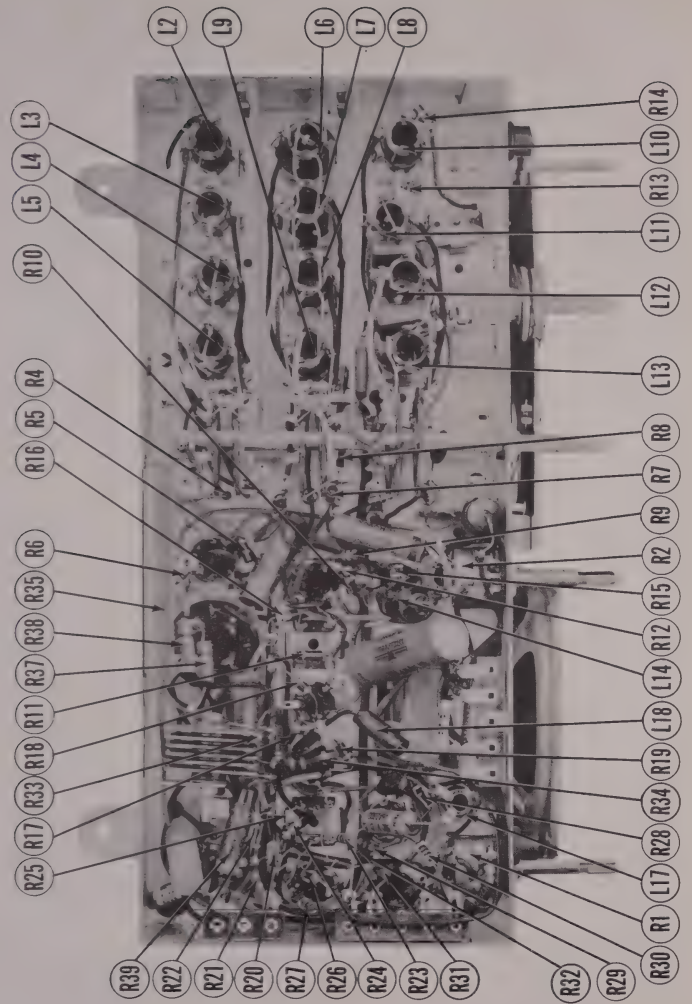

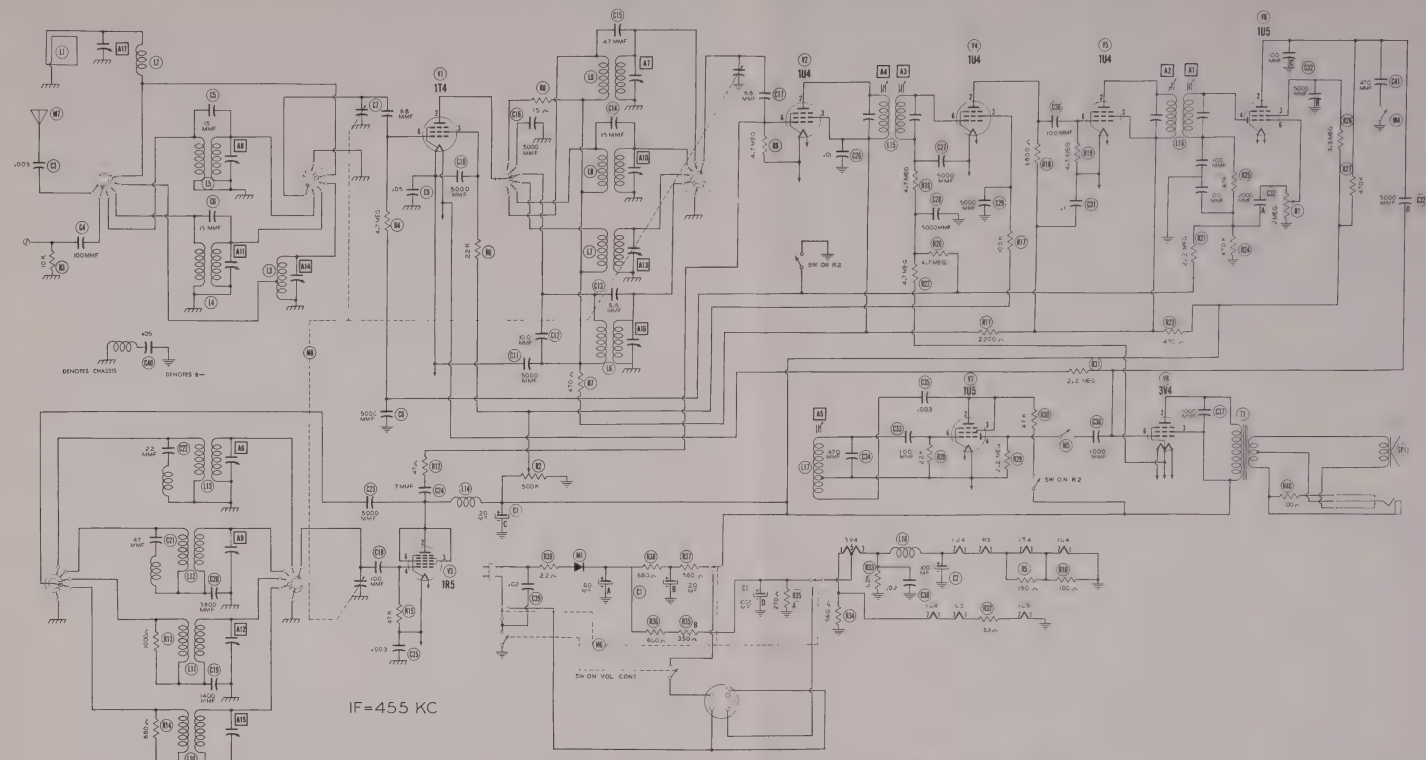

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1T4	..4VDC	70VDC	68VDC	0V.	1.1VDC	1.1VDC	1.1VDC
V2	1U4	0V.	70VDC	70VDC	1.4V.	0V.	1.1VDC	1.4VDC
V3	1R5	2.8VDC	67VDC	70VDC	See par 4	1.4VDC	67VDC	1.4VDC
V4	1U5	1.1	6.4VDC	6.4VDC	1.4V.	6.4VDC	0V.	1.4VDC
V5	1U4	6.4VDC	70VDC	70VDC	1.4V.	6.4VDC	0V.	1.4VDC
V6	3V4	0V.	430VDC	390VDC	0V.	1.4V.	0V.	1.4V.
V7	1U5	3VDC	60VDC	60VDC	1.1VDC	0V.	2.2MEG	6.4VDC
V8	1S4	6.8VDC	80VDC	87VDC	0V.	72.2VDC	0V.	1.4VDC

TAKEN WITH VACUUM TUBE VOLTMETER

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1T4	*	1.1MEG	1.1MEG	*	*	*	*
V2	1U4	*	1.1MEG	1.1MEG	*	0V.	1.1MEG	1.1MEG
V3	1R5	*	1.1MEG	1.1MEG	See par 4	1.1MEG	1.1MEG	1.1MEG
V4	1U5	*	1.1MEG	1.1MEG	*	*	0V.	1.1MEG
V5	1U4	*	1.1MEG	1.1MEG	*	*	0V.	1.1MEG
V6	3V4	*	1.1MEG	1.1MEG	*	*	*	1.1MEG
V7	1U5	*	1.1MEG	1.1MEG	*	*	2.2MEG	1.1MEG
V8	1S4	*	1.1MEG	1.1MEG	*	*	*	1.1MEG

DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: HALLICRAFTER PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	RF Amp.	1T4	1T4	6AR	
V2	Mixer	1U4	1U4	6AR	
V3	Oscillator	1R5	1R5	7AT	
V4	1st IF Amp.	1U4	1U4	6AR	
V5	2nd IF Amp.	1U4	1U4	6AU	
V6	DET.-AVC-AF	1U5	1U5	6BW	
V7	BFO	1U8	1U8	6BW	
V8	Power Output	3V4	3V4	6BX	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Hallicrafters Part No.	AEROVOX Part No.	CORNELL-DUBILIER Part No.	ERIE Part No.	SPRAGUE Part No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	60	150	45B155	AF1344D300P			TVL-68	▲ Filter
B	30	150					UHC1015	■ Filter
C	30	150						▲ Filter
D	1000	15						Filament Bypass
C2	100	35	45A118	PR835/100	BRH35A		UHC-102	Filament Bypass
C3	.003	600	46AZ302J	P688-003	GT6D3	GP3M-003	TM-23	Ant. Coupling
C4	100		47B20101K5	1468-0001	5W5T1	GP1K-100	1FM-31	Ant. Coupling
C5	15		47B20150K5			GP1K-15	MS-415	RF Coupling
C6	15		47B20150K5			GP1K-15	MS-415	RF Coupling
C7	68		47B20680K5	1469-00007	5W8Q7	GP1K-68	MS-47	RF Coupling
C8	5000		47A168	1467-005	1D5D5	81L-005	39C1	AVC Filter
C9	.05	400	46AU503J	P468-05	GT4S5		TM-15	Bias Filter
C10	5000		47A168	1467-005	1D5D5	81L-005	39C1	RF Screen Bypass
C11	5000		47A168	1467-005	1D5D5	81L-005	39C1	RF Plate Decoupling
C12	100		47B20101K5	1468-0001	5W5T1	GP1K-100	1FM-31	Fixed Trimmer
C13	5.6		47A160-7					RF Coupling
C14	15		47B20150K5			GP1K-15	MS-415	RF Coupling
C15	47		47B20470K5	1468-00008	5W5Q5	GP1K-47	1FM-45	RF Coupling
C16	5000		47A168	1467-005	1D5D5	81L-005	39C1	RF Plate Decoupling See Note
C17	68		47B20680K5	1469-00007	5W5Q7	GP1K-68	MS-47	RF Coupling
C18	100		47B20101K5	1468-0001	5W5T1	GP1K-100	1FM-31	Osc. Grid Cap.
C19	1400	500	47X30A142J					Fixed Padder
C20	3900	500	47X35A392J					Fixed Padder
C21	47		47B20500K5	1469-00005	5R5Q5	NPOM-50	MS-45	Fixed Padder
C22	22		47B20220K5			GP1K-22		Fixed Padder
C23	5000		47A168	1467-005	1D5D5	81L-005	39C1	Osc. Feedback
C24	7		47X20UK070K			NPOK-8.6		Osc. Coupling
C25	.003	600	46AZ302J	P688-003	GT6D3	GP2M-003	TM-23	Osc. Fil. Bypass
C26	.01	600	46AY103J	P688-01	GT8S1	GP3-335-01	TM-11	Decoupling
C27	5000		47A168	1467-005	1D5D5	81L-005	39C1	AVC Filter
C28	5000		47A168	1467-005	1D5D5	81L-005	39C1	AVC Filter
C29	5000		47A168	1467-005	1D5D5	81L-005	39C1	1st IF Screen Bypass
C30	100		47B20101K5	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C31	.1	200	46AU104J	P288-1	GT2P1		TM-1	Decoupling
C32A	3000		47A203	P688-002	GT6D2	GP3M-002	TM-22	Audio Coupling
B	5000			P688-005	GT6D5	GP2M-005	TM-25	AF Amp. Screen Bypass
C	100			1468-0001	5W5T1	GP1K-100	1FM-31	AF Amp. Plate Bypass
D	5000			P688-005	GT6D5	GP2M-005	TM-25	Audio Coupling
C33	100	500	47X30A101M	1468-0001	5W5T1	GP1K-100	1FM-31	BFO Grid Cap.
C34	470	500	47X30A471K	1469-0005	5R5T5		MS-35	Fixed T rimmer
C35	.003	600	46AZ302J	P688-003	GT6D3	GP2M-003	TM-23	Osc. Feedback
C36	1000		47B30102K5	1468-001	1W5D1	GP2L-001	1FM-21	BFO Coupling
C37	1000		47B30102K5	1468-001	1W5D1	GP2L-001	1FM-21	Output Plate Bypass
C38	.02	600	46AU203J	P688-02	GT8S2		TM-12	Filament Bypass
C39	.02	600	46BR203L8	P688-02	GT8S2		TM-12	Line Filter
C40	.05	600	46A150	P688-05 ‡	GT8S5 ‡		TSP51	Line Isolation
C41	470	500	47X30A471K	1468-0005	5W5T5	GP2K-470	1FM-35	Tone Compensation

Note. Not used in all models.
‡ When replacing Item C40, wind 21 turns of hookup wire on capacitor and connect in circuit as per original capacitor.

PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: HALLICRAFTER PART No.	REPLACEMENT DATA: JENSEN PART No.	REPLACEMENT DATA: QUAM PART No.	INSTALLATION NOTES
SP1	PM	3.5Ω	85D93	8T-10S *† MOD. P5-X	5A07 † #	* Fabricate mounting bracket. † Remount output transformer. # Use mounting brackets provided.
	CONE DIA.	V. C. DIA.				
SP2	4 3/8"	9/16"				

R F COILS

ITEM No.	USE	DC RES: PRI.	DC RES: SEC.	REPLACEMENT DATA: HALLICRAFTER PART No.	REPLACEMENT DATA: MEISSNER PART No.	
L1	Loop Ant.	4Ω		57C125		
L2	Ant. Loading	3.5Ω		51B1138		Band #1
L3	Ant. Trans.	2Ω		51B1137		Band #2
L4	Ant. Trans.	3Ω	7Ω	51B1138		Band #3
L5	Ant. Trans.	2Ω	4Ω	51B1139		Band #4
L6	RF Trans.	95Ω	9Ω	51B1140		Band #1
L7	RF Trans.	3Ω	3Ω	51B1141		Band #2
L8	RF Trans.	3Ω	0Ω	51B1142		Band #3
L9	RF Trans.	2Ω	0Ω	51B1143		Band #4
L10	Osc. Coil	1.5Ω	9Ω	51B1144		Band #1
L11	Osc. Coil	1Ω	2.5Ω	51B1145		Band #2
L12	Osc. Coil	0Ω	.8Ω	51B1146		Band #3
L13	Osc. Coil	0Ω	.7Ω	51B1147		Band #4
L14	RF Choke	34Ω		53A008		
L15	1st IF	23Ω	23Ω	50C233	16-6668	
L16	2nd IF	25Ω	25Ω	50C234		
L17	BFO Osc.	8Ω		50B402		
L18	Fil. Choke	4Ω		53A121		

SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	REPLACEMENT DATA: HALLICRAFTER PART No.	REPLACEMENT DATA: SYLVANIA PART No.	NOTES
M1	.155A	27A51	ND-5	

BATTERIES

ITEM No.	VOLTAGE	Hallicrafters PART No.	REPLACEMENT DATA: EVEREADY "A"	EVEREADY "B"	EVEREADY "A-B"	BURGESS "A"	BURGESS "B"	BURGESS "A-B"	INSTALLATION NOTES
M3	7.5V "A" 90V "B"				754			G6M80	

MISCELLANEOUS

ITEM No.	PART NAME	HALLICRAFTERS PART No.	NOTES
M3	Switch	50C362	Band
M4	Switch	50A361	Tone
M5	Switch	50A365	ANL
M6	Switch		AC/DC-Battery
M7	Antenna	72A035	Whip
M8	3 Gang. Var. Cap.	48C221	(23-452MMF) Each Section
	Trimmer Strip	44B374	A5, A9, A12, A15
	Trimmer Strip	44B374-2	A7, A10, A13, A16
	Trimmer Strip	44B374-1	A6, A11, A14, A17
	Variable Cap.	44B375	Band Spread
	Knob	15B172	
	Knob	15B177	With Dot
	Pointer	82A161	Main Tuning
	Pointer	82A161-1	Band Spread
	Cabinet	78F423	

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: Hallicrafters PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1A	2 Meg.	½	25B839	Q13-139	AM-68-Z	Volume control
B	Shaft		Not Req.	Not Req.	K55-3	Attach to R1A per instructions
C	Switch		Not Req.	76-2	SW-A2	Attach to R1A per instructions
R2	500KΩ	½	25B847			RF Gain Control and Voice-Code Switch

RESISTORS

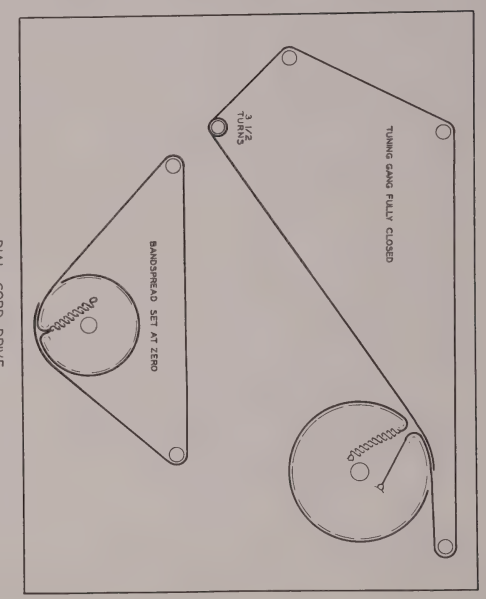
ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: HALLICRAFTERS PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R3	10KΩ	½	23X20X103K	BTS-10K	Ant. Loading
R4	4.7 Meg.	½	23X20X475M	BTS-4.7 Meg.	RF Grid
R5	150Ω	½	23X20X151K	BW-½-150	RF Filament Shunt
R6	22KΩ	½	23X20X223K	BTS-22K	RF Screen
R7	470Ω	½	23X20X471K	BTS-470	RF Plate Decoupling
R8	15Ω	½			Parasitic Supp. See Note
R9	4.7 Meg.	½	23X20X475M	BTS-4.7 Meg.	Mixer Grid
R10	100Ω	½	23X20X101K	BW-½-100	Mixer Filament Shunt
R11	2200Ω	½	23X20X222K	BTS-2200	Decoupling
R12	47Ω	½	23X20X470K		Parasitic Supp.
R13	1000Ω	½	23X20X102K	BTS-1000	Osc. Coil Shunt
R14	680Ω	½	23X20X681K	BTS-680	Osc. Coil Shunt
R15	47KΩ	½	23X20X473K	BTS-47K	Osc. Grid
R16	4.7 Meg.	½	23X20X475M	BTS-4.7 Meg.	AVC Network
R17	100KΩ	½	23X20X104K	BTS-100K	1st IF Screen
R18	6800Ω	½	23X20X682K	BTS-6800	1st IF Plate
R19	4.7 Meg.	½	23X20X475M	BTS-4.7 Meg.	2nd IF Grid
R20	4.7 Meg.	½	23X20X475M	BTS-4.7 Meg.	AVC Network
R21	2.2 Meg.	½	23X20X225M	BTS-2.2 Meg.	AVC Network
R22	4.7 Meg.	½	23X20X475M	BTS-4.7 Meg.	AVC Network
R23	470Ω	½	23X20X471K	BTS-470	Decoupling
R24	470KΩ	½	23X20X474K	BTS-470K	Diode Load
R25	47KΩ	½	23X20X473K	BTS-47K	Diode Filter
R26	2.2 Meg.	½	23X20X225M	BTS-2.2 Meg.	AF Screen
R27	470KΩ	½	23X20X474K	BTS-470K	AF Plate
R28	22KΩ	½	23X20X223K	BTS-22K	BFO Grid
R29	2.2 Meg.	½	23X20X225M	BTS-2.2 Meg.	BFO Diode Load
R30	47KΩ	½	23X20X473K	BTS-47K	BFO Plate
R31	2.2 Meg.	½	23X20X225M	BTS-2.2 Meg.	Output Grid
R32	33Ω	½	23X20X330K	BW-½-33	Filament String
R33	1200Ω	½	23X20X122K	BTS-1200	Filament String
R34	560Ω	1	23X30X561K	BTA-560	Filament String
R35A	270Ω	2.3	24A912	AB-250	Filament String, Wire Wound
B	350Ω	5.5		AB-350	Filament Dropping, Wire Wound
R36	600Ω	9.3	24A913	AB-600	Filament Dropping, Wire Wound
R37	560Ω	1	23X30X561K	BTA-560	Filter
R38	680Ω	1	23X30X681K	BTA-680	Filter
R39	32Ω	2	24BC320E		Surge Limiter , Wire Wound
R40	100Ω	½	23X20X101K	BW-½-100	Output Transformer Shunt

Note. Not used in all models.

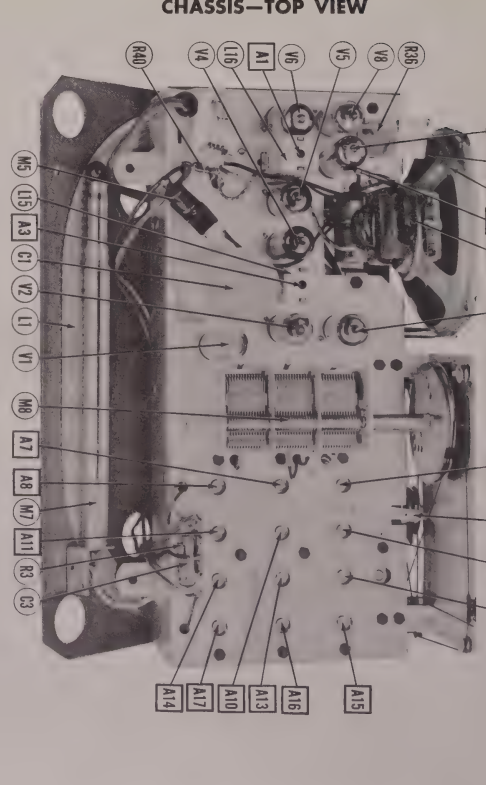
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: Hallicrafters PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
T1	7KΩ	3.5Ω and 500Ω to 5000Ω	65Ω	100.3Ω Tapped at .3Ω	Part of 85C093				

SET 82
FOLDER 6



CHASSIS—TOP VIEW



ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer turn tuning cap fully closed and set pointer to last reference mark at low frequency end of dial.

Use battery power when aligning receiver. Do not use a power transformer when available. If not, connect a 1MFD condenser between the chassis and B- terminal of the signal generator and B- terminal of the receiver. Use signal generator output reading. Use dial to tune. If the trimmer closes completely before the dial reaches zero, loosen the set screws on the drive drum and turn the trimmer 1/2 turn counter-clockwise from tight. Turn the band-spread pointer to zero and tighten the set screws. Leave the band-spread dial at zero during entire alignment. After completing step 2, connect a 100MMF capacitor between the external antenna lead and chassis.

| | | | | | |

PHOTOFACT* Folder

*TRADE MARK

MAGNAVOX CHASSIS
CT-219, CT-220, CT-222

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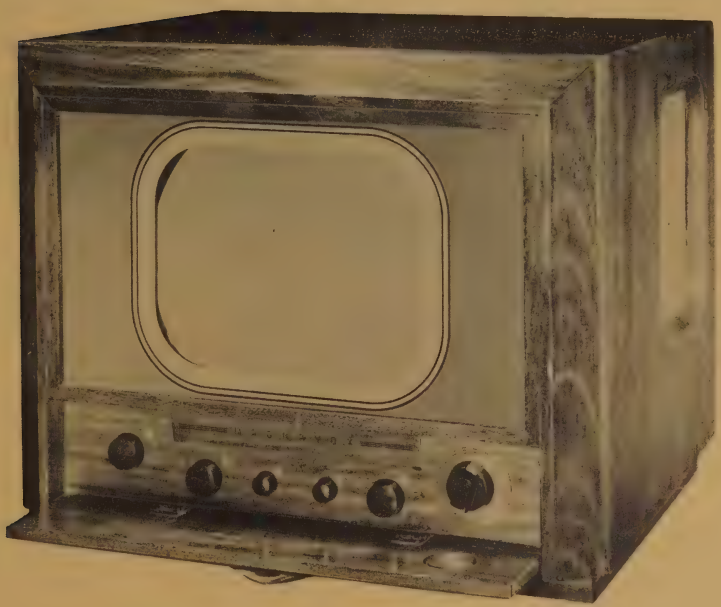

MODEL CT-220

MAGNAVOX CHASSIS
CT-219, CT-220, CT-222

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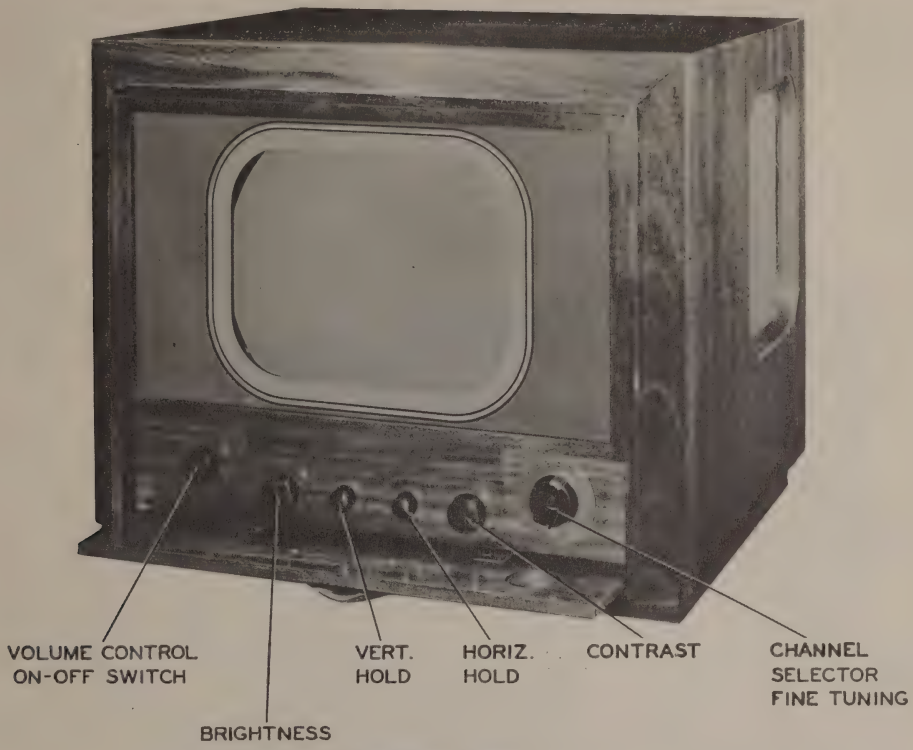

MAGNAVOX CHASSIS MODEL CT-220

TRADE NAME	Magnavox, Chassis Models CT-219, CT-220, and CT-222 (Suffix "A", "B", "C", and "D")
MANUFACTURER	Magnavox Co., 2131 Bueter Rd., Fort Wayne, Indiana
TYPE SET	TV Receiver
TUBES	Twenty Four
POWER SUPPLY	110-120 Volts AC-60 Cycles
RATING:	2.0 Amp. at 117 Volts AC
TUNING RANGE—	Channels 2 thru 13

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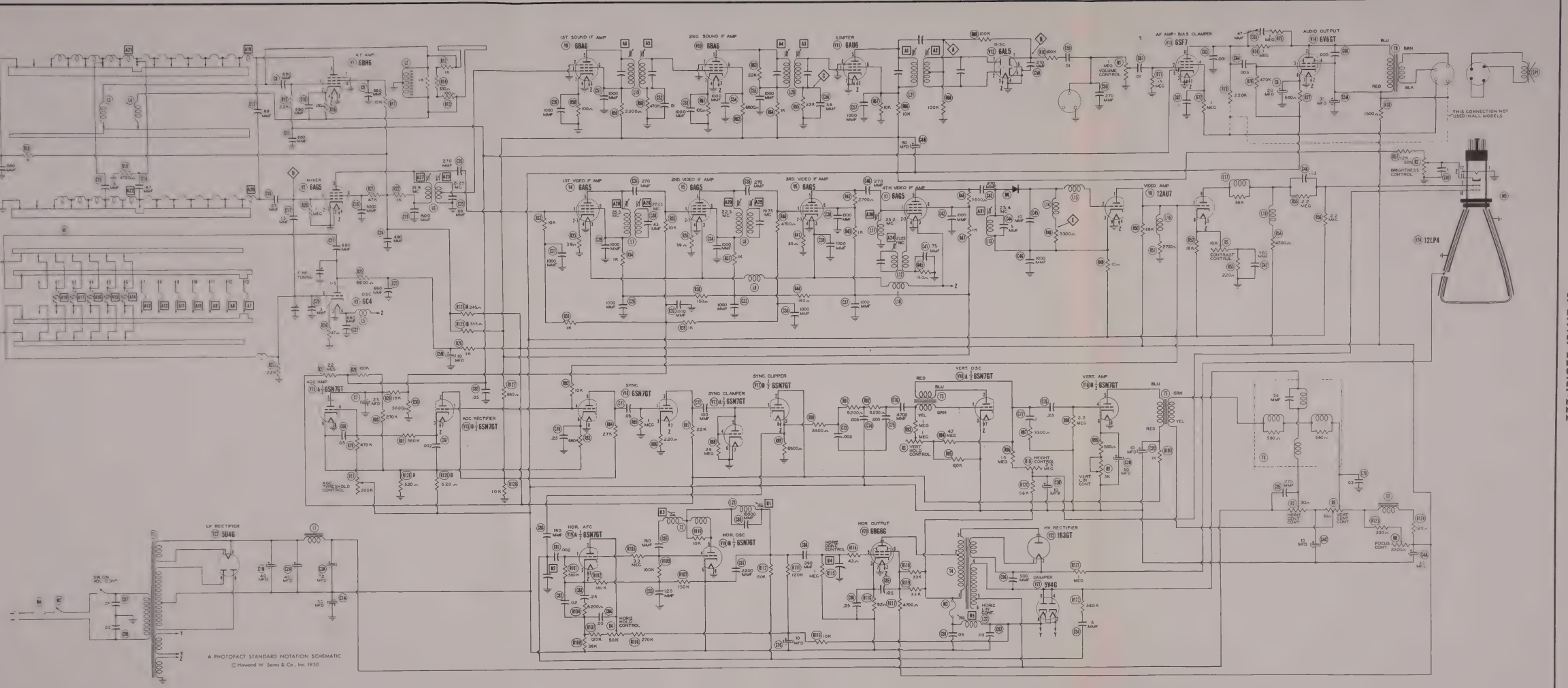
MAGNAVOX CHASSIS
CT-219,CT-220,CT-222


MAGNAVOX CHASSIS
CT-219.CT-220.CT-222
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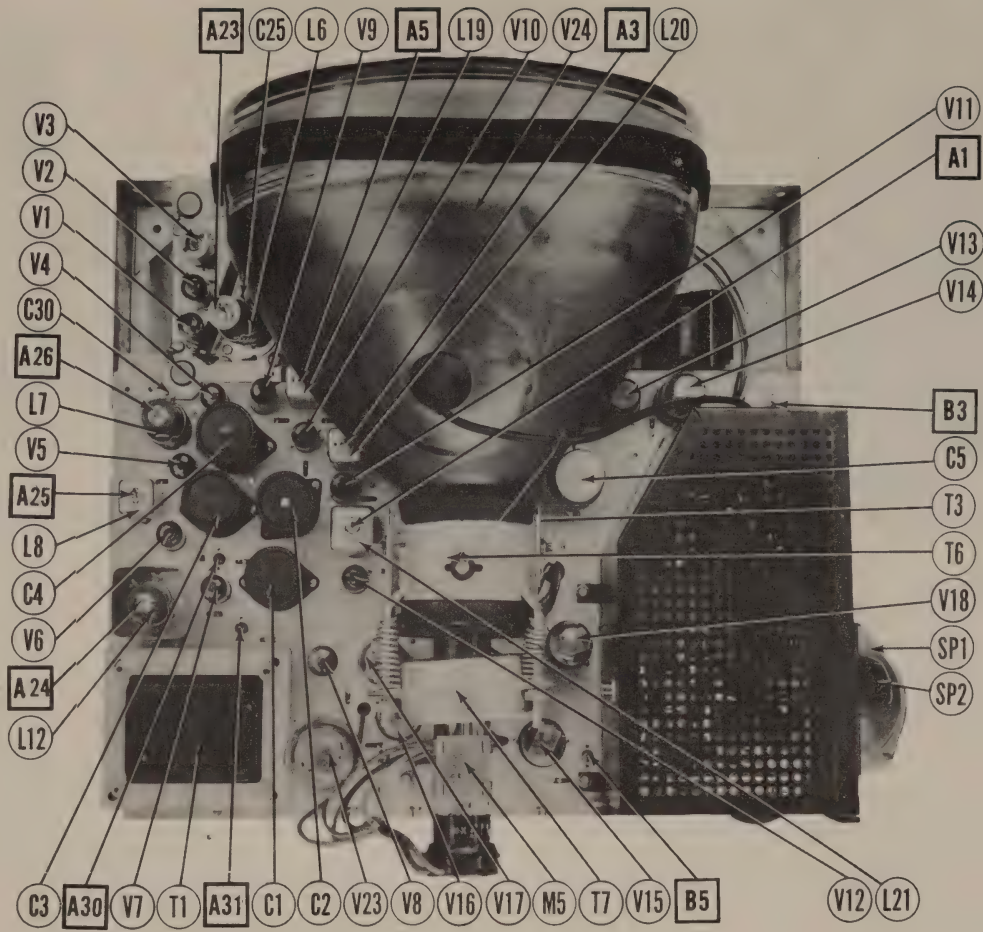
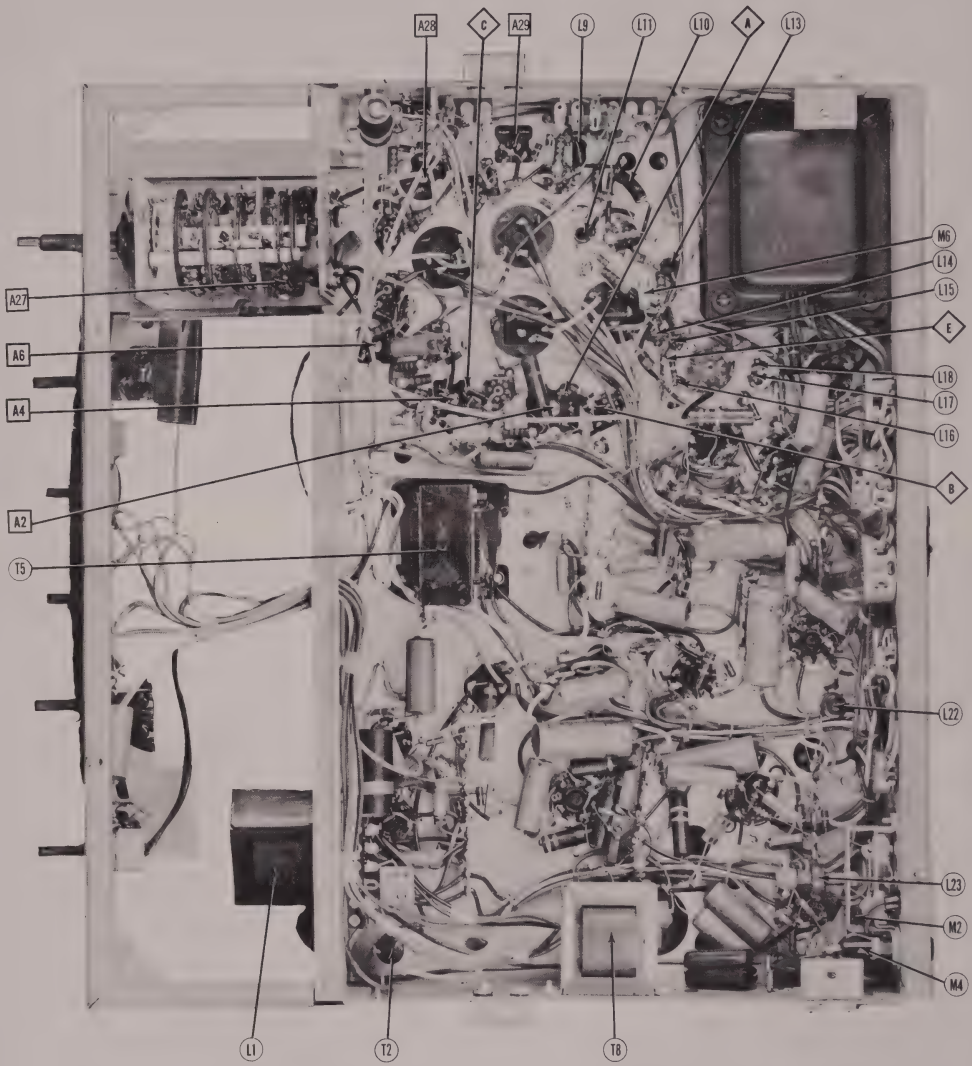
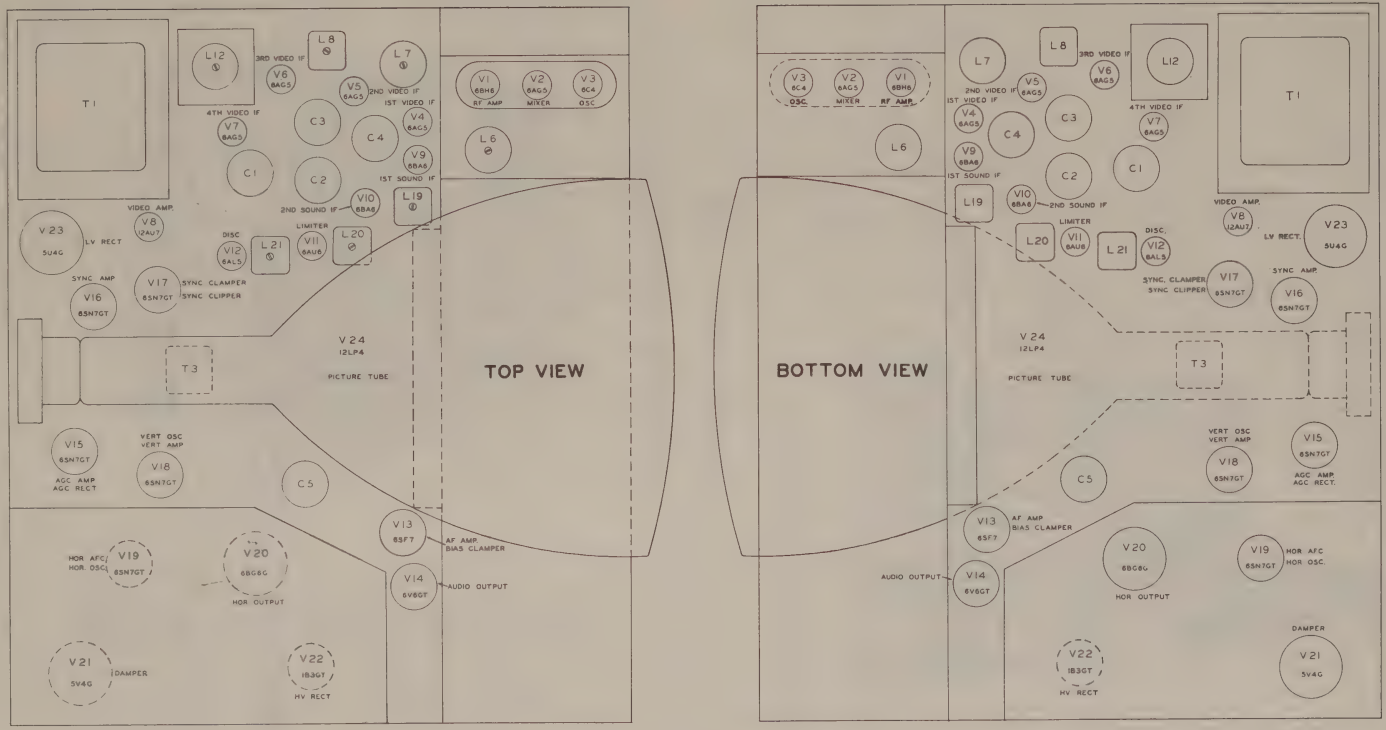


CHASSIS TOP VIEW

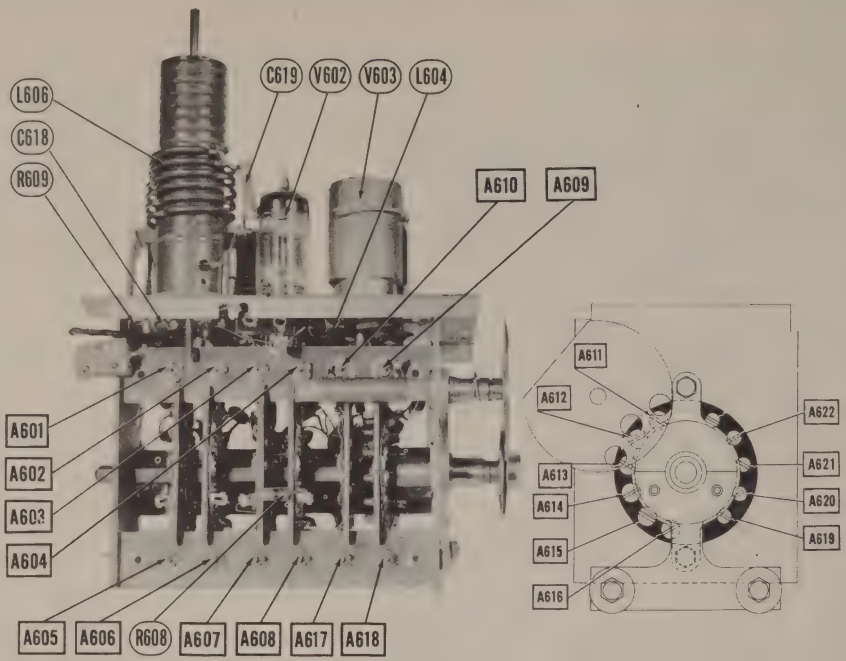


CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

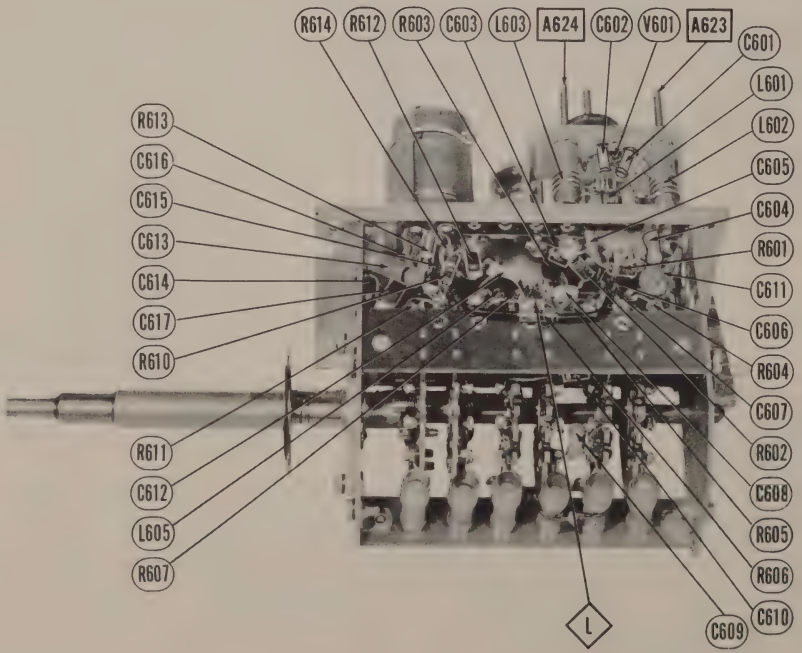


TUBE PLACEMENT CHART

MAGNAVOX CHASSIS
CT-219, CT-220, CT-222



RF TUNER-LEFT SIDE



RF TUNER-RIGHT SIDE

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To eliminate the high voltage shock hazard, remove the horizontal oscillator tube (V19) from its socket.

SOUND IF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	.01MFD	High side to pin 1 (Grid) of 6AU6 (V11). Low side to chassis.	21.25MC	Any channel unused locally.	DC Probe thru 1 Meg. to Point (A) Common to chassis.	A1	Adjust for maximum deflection.
2.	.01MFD	"	"	"	DC Probe thru 1 Meg. to Point (B) Common to chassis.	A2	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

3. Detune the signal generator to obtain maximum deflection on either side of zero. Note signal generator reading at this point. Now tune signal generator to opposite side of the zero reading for maximum deflection. Note the signal generator frequency. If the peaks are not of equal amplitudes, slightly retouch A1 until maximum positive and negative readings occur at the same frequency change either side of zero reading.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	.01MFD	High side to pin 1 (Grid) of 6BA6 (V9). Low side to chassis.	21.25MC (1MC Sweep)	21.25MC	Any channel unused locally.	Vert. Amp. to Point (C) Low side to chassis.	A3, A4, A5, A6	Adjust for maximum amplitude and symmetry as per Fig 1. If 60 ~ sweep is used shunt R65 with 5600Ω.

TUNER ALIGNMENT

The three chassis covered in this folder employ different tuners. Determine which chassis is to be aligned and use the RF alignment for that chassis.

Normally the oscillator circuits are all that will require alignment.

The RF and mixer circuits are very stable; alignment of them should not be attempted unless they are definitely known to be out of alignment.

Remove the AGC amplifier V15. During tuner alignment, connect the negative lead of a 1 1/2 battery to pin 5 of the AGC amp. socket. Connect the positive lead to chassis.

OSCILLATOR ALIGNMENT (CT-220)

Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
5.	Two 125Ω carbon res.	Across antenna terminals with 125Ω in each lead.	215.75MC (Unmod.)	13	DC Probe to Point (B) Low side to chassis.	A7	Expand or compress coil turn to zero reading, a positive and negative reading will occur on either side of the correct setting.
			209.75MC	12		A8	
			203.75MC	11		A9	
			197.75MC	10		A10	
			191.75MC	9		A11	
			185.75MC	8		A12	
			179.75MC	7		A13	
			87.75MC	6		A14	Adjust slug for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
			81.75MC	5		A15	
			71.75MC	4		A16	
			65.75MC	3		A17	
			59.75MC	2		A18	

RF and MIXER ALIGNMENT (CT-220)

The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Two 125Ω carbon res.	Across antenna terminals with 125Ω in each lead.	213MC (10MC Sweep)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to Point (D) Low side to chassis.	A19, A20	Expand or compress coil turns for response curve similar to Fig 2 with markers above 70%.
7.	"	"	207MC (10MC Sweep)	205.25MC 209.75MC	12	"		Check for response curve similar to Fig 2. If markers are below 70% on any channel, make slight adjustment of A19 and A20 with channel switch set for that channel. Recheck all high band channels to set that they have not been seriously effected.
			201MC (10MC Sweep)	199.25MC 203.75MC	11			
			195MC (10MC Sweep)	193.25MC 197.75MC	10			
			189MC (10MC Sweep)	187.25MC 191.75MC	9			
			183MC (10MC Sweep)	181.25MC 185.75MC	8			
			177MC (10MC Sweep)	175.25MC 179.75MC	7			
8.	"	"	85MC (10MC Sweep)	83.25MC 87.75MC	6	"	A21, A22	Expand or compress coil turns for response curve similar to Fig 2 with markers above 70%.
9.	"	"	79MC (10MC Sweep)	77.25MC 81.75MC	5	"		Check for response similar to Fig 2. If markers are below 70% on any channel. Slight adjustment may be made by expanding or compressing the RF and Mixer coils for that channel. Continue with step 13.
			69MC (10MC (Sweep)	67.25MC 71.75MC	4			
			63MC (10MC Sweep)	61.25MC 65.75MC	3			
			57MC (10MC Sweep)	55.25MC 59.75MC	2			

ALIGNMENT INSTRUCTIONS (CONT.)

OSCILLATOR ALIGNMENT (CT-219)

Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
5.	Two 125Ω carbon res.	Across antenna terminals with 125Ω in each lead.	215.75MC (Unmod.)	13	DC Probe to Point (8) Common to chassis.	A609, A610	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Keep slug pairs at approximately the same relative position.
6.	"	"	209.75MC	12	"	A611	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
			203.75MC	11		A612	
			197.75MC	10		A613	
			191.75MC	9		A614	
			185.75MC	8		A615	
			179.75MC	7		A616	
7.	"	"	87.75MC (Unmod.)	6	"	A617, A618	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Keep slug pairs at approximately the same relative position.
8.	"	"	81.75MC	5	"	A619	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
			71.75MC	4		A620	
			65.75MC	3		A621	
			59.75MC	2		A622	

RF and MIXER ALIGNMENT (CT-219)

The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 125Ω carbon res.	Across antenna terminals with 125Ω in each lead.	213MC (10MC Sweep)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to Point (1) Low side to chassis.	A601, A602, A603, A604	Adjust for response curve similar to Fig. 2 with markers above 70%. Keep slug pairs at approximately the same relative position.
10.	"	"	207MC (10MC Sweep)	205.25MC 209.75MC	12	"		Check for response curve similar to Fig. 2. If markers are below 70% on any channel, make slight adjustment of A601, A602, A603, and A604 with channel switch set for that channel. Recheck all high band channels to see that they have not been seriously effected.
			201MC (10MC Sweep)	199.25MC 203.75MC	11			
			195MC (10MC Sweep)	193.25MC 197.75MC	10			
			189MC (10MC Sweep)	187.25MC 191.75MC	9			
			183MC (10MC Sweep)	181.25MC 185.75MC	8			
			177MC (10MC Sweep)	175.25MC 179.75MC	7			
11.	"	"	85MC (10MC Sweep)	83.25MC 87.75MC	6	"	A605, A606, A607, A608	Adjust for response curve similar to Fig. 2 with markers above 70%. Keep slug pairs at approximately the same relative position.
12.	"	"	79MC (10MC Sweep)	77.25MC 81.75MC	5	"		Check for response curve similar to Fig. 2. If markers are below 70% on any channel, make slight adjustment of A605, A606, A607, and A608 with channel switch set for that channel. Recheck all low band channels to see that they have not been seriously effected. If wave traps are not to be adjusted continue with step 13.
			69MC (10MC Sweep)	67.25MC 71.75MC	4			
			63MC (10MC Sweep)	61.25MC 65.75MC	3			
			57MC (10MC Sweep)	55.25MC 59.75MC	2			

WAVE TRAP ADJUSTMENT (CT-219)

Wave traps A623 and A624 are used for specific types of interference and their alignment will depend upon the type encountered. With the receiver tuned to the channel having the interference set fine tuning control until interference is at maximum. Adjust A623 and A624 for minimum interference in the picture and sound, keeping the cores at approximately the same relative position. Turn one core 1/2 turn, adjust the other for minimum interference.

FIG. 1

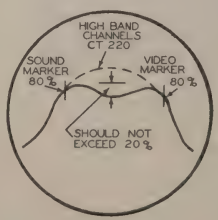


FIG. 2

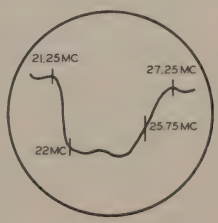


FIG. 3

ALIGNMENT INSTRUCTIONS (CONT.)

OSCILLATOR ALIGNMENT (CT-222)

Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
5.	Two 125Ω carbon res.	Across antenna terminals with 125Ω in each lead.	215.75MC (Unmod.)	13	DC Probe to Point (B). Low side to chassis.	A311	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
6.	"	"	87.75MC	6	"	A312	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Check to see that all channels are received well within the range of the fine tuning control, if not compromise may be made by using A311 for the high channels, and A312 for the low channels.

R F and MIXER ALIGNMENT (CT-222)

The sweep generator should be terminated with its characteristic impedance, usually 50Ω.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Two 125Ω carbon res.	Across antenna terminals with 125Ω in each lead.	213MC (10MC Sweep)	211.25MC 215.75MC	13	Vert. Amp. to Point (K). Low side to chassis.	A301, A302, A303, A304	Adjust for response curve similar to Fig 2 with markers above 70%. Keep trimmer pairs at approximately the same relative position.
8.	"	"	177MC (10MC Sweep)	175.25MC 179.75MC	7	"	A305, A306	Adjust rings for response curve similar to Fig 2 with markers above 70%.
9.	"	"	183MC (10MC Sweep)	181.25MC 185.75MC	8	"		Check all high band channels for response similar to Fig 2. Slight adjustment of A301 thru A306 may be necessary for optimum response.
			189MC (10MC Sweep)	187.25MC 191.75MC	9			
			195MC (10MC Sweep)	193.25MC 197.75MC	10			
			201MC (10MC Sweep)	199.25MC 203.75MC	11			
			207MC (10MC Sweep)	205.25MC 209.75MC	12			
10.	"	"	85MC (10MC Sweep)	83.25MC 87.75MC	6	"	A307, A308, A309, A310	Adjust for response similar to Fig 2 with markers above 70%.
11.	"	"	79MC (10MC Sweep)	77.25MC 81.75MC	5	"		Check all low band channels for response for response similar to Fig 2. Slight adjustment of A307 thru A310 may be necessary to obtain optimum response. Continue with step 13.
			69MC (10MC Sweep)	67.25MC 71.75MC	4			
			63MC (10MC Sweep)	61.25MC 65.75MC	3			
			57MC (10MC Sweep)	55.25MC 59.75MC	2			

WAVE TRAP ADJUSTMENT (CT-222)

Wave traps A313 and A314 are used for specific types of interference and their alignment will depend upon the type encountered. With the receiver tuned to the channel having the interference set fine tuning control until interference is at maximum. Adjust A313 and A314 for minimum interference in the picture and sound, keeping the cores at approximately the same relative position. Turn one core 1/2 turn, adjust the other for minimum interference.

VIDEO IF ALIGNMENT

Remove the AGC tube V15. During video IF alignment connect the negative lead of a 3 volt battery to pin 5 of the AGC tube socket, connect the positive lead to chassis.

Remove the local oscillator tube V3 to eliminate the possibility of erroneous indications.

The case of the VTVM is at -100 volts with respect to chassis during video IF alignment, avoid grounding or touching the VTVM case.

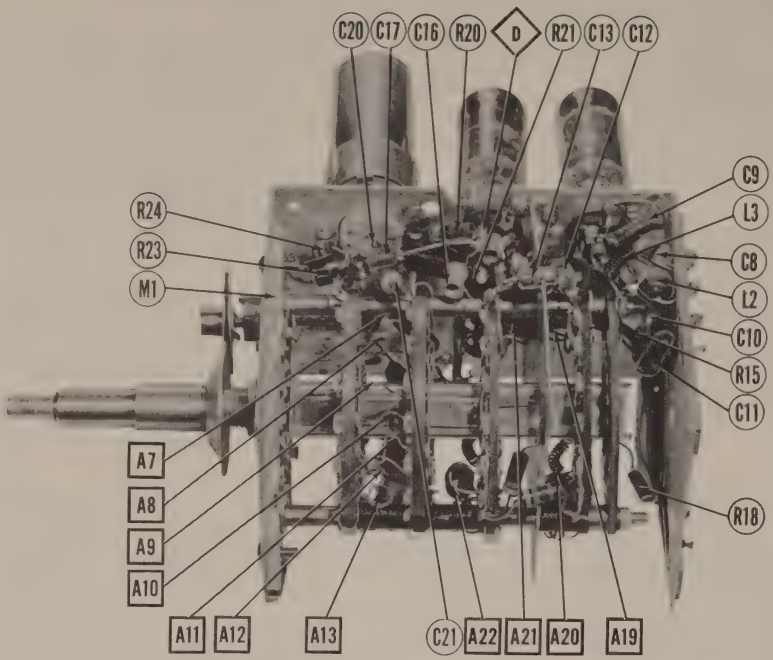
The adjustment A29 may have two peaks, use the one with the slug farthest in.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
13.	Direct	High side to ungrounded tube shield floating over mixer tube V2. Low side to chassis.	21.25MC (Unmod.)	Any	DC Probe and common lead across R48. (DC Probe to Point (E). Common to opposite end of R48).	A23, A24	Adjust for MINIMUM deflection.
14.	Direct	"	19.75MC	"	"	A25	"
15.	Direct	"	27.25MC	"	"	A26	"
16.	Direct	"	21.8MC	"	"	A27	Adjust for maximum deflection.
17.	Direct	"	25.3MC	"	"	A28	"
18.	Direct	"	22.3MC	"	"	A29	"
19.	Direct	"	25.2MC	"	"	A30	"
20.	Direct	"	23.4MC	"	"	A31	"

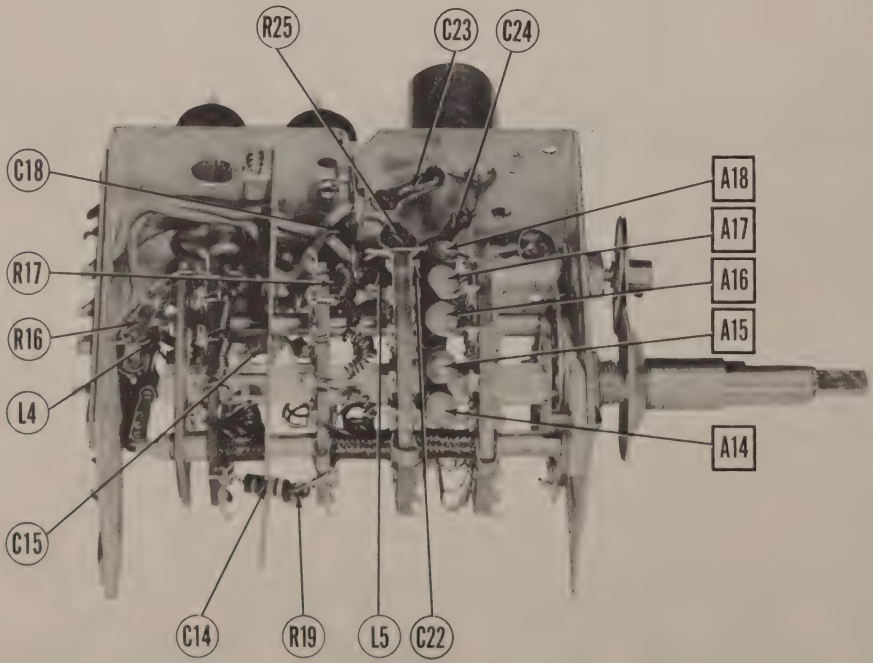
OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

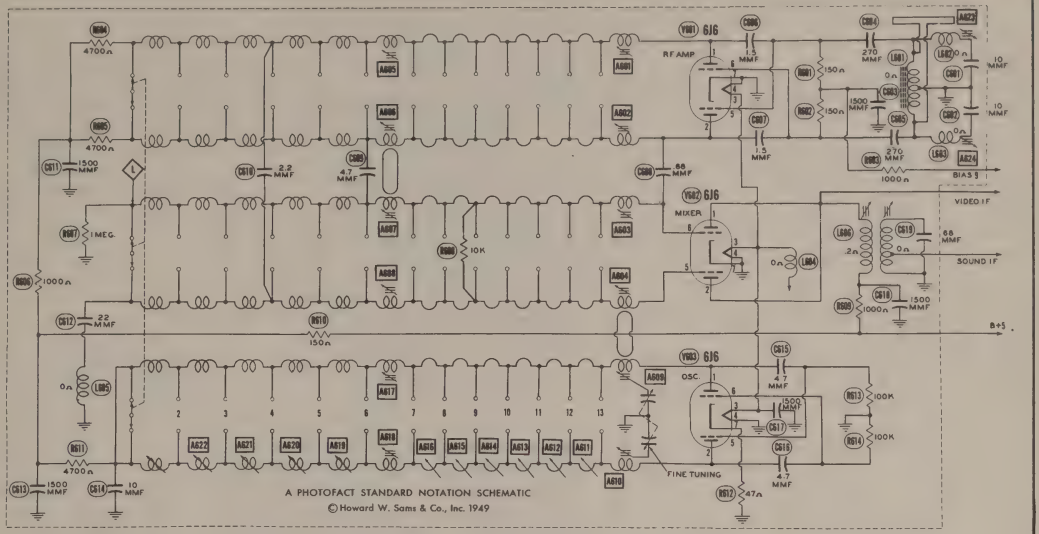
	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
21.	Direct	High side to ungrounded tube shield floating over mixer tube V2. Low side to chassis.	24MC (10MC Sweep)	21.25MC 22 MC 25.75MC 27.25MC	Any	Vert. Amp. to Point (E). Low side to chassis.		Check for response curve similar to Fig 3 with markers as shown. If necessary slightly retouch A31 and A30 in that order for response. Do not change A29 or the trap adjustments A23 thru A26.



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE



RF TUNER

PARTS LIST AND DESCRIPTIONS

TUBES

ITEM No.	USE	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	
V601	R. F. Amp.	6J6	7BF	
V602	Mixer	6J6	7BF	
V603	Oscillator	6J6	7BF	

CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT	IDENTIFICATION
C601	10		Fixed Trimmer
C602	10		Fixed Trimmer
C603	1500		RF Bypass
C604	270		RF Coupling
C605	270		RF Coupling
C606	1.5		Neutralizing
C607	1.5		Neutralizing
C608	.68		RF Coupling
C609	4.7		RF Coupling
C610	2.2		RF Coupling
C611	1500		RF Decoupling
C612	22		Fixed Trimmer
C613	1500		Osc. Decoupling
C614	10		Fixed Trimmer
C615	4.7		Osc. Feedback
C616	4.7		Osc. Feedback
C617	1500		Filament Bypass
C618	1500		Mixer Decoupling
C619	68		Fixed Trimmer

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	IDENTIFICATION
R601	150Ω	½	RF Grid
R602	150Ω	½	RF Grid
R603	1000Ω	½	Bias Filter
R604	4700Ω	½	RF Plate
R605	4700Ω	½	RF Plate
R606	1000Ω	½	RF Decoupling
R607	1 Meg.	½	Mixer Grid
R608	10KΩ	½	Mixer Grid Shunt
R609	1000Ω	½	Mixer Decpupling
R610	150Ω	½	Decoupling
R611	4700Ω	½	Osc. Plate
R612	47Ω	½	Osc. Cathode
R613	100KΩ	½	Osc. Grid
R614	L00KΩ	½	Osc. Grid

COILS

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	
L601	Ant. Input	0Ω		
L602	Interference Trap	0Ω		
L603	Interference Trap	0Ω		
L604	Filament Choke	0Ω		
L605	Mixer Grid Trap	0Ω		
L606	1st. Video IF and Sound Trap	.22	0Ω	

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BH6	.4VDC	1.9VDC	0V	6.3VAC	180VDC	160VDC	0V		
V 2	6AG5	-.5VDC	0V	0V	6.3VAC	180VDC	90VDC	0V		
V 3	6C4	157VDC	0V	0V	6.3VAC	157VDC	§-3VDC	3.3VDC		
V 4	6AG5	-.9VDC	.3VDC	6.3VAC	0V	135VDC	135VDC	.3VDC		
V 5	6AG5	-.7VDC	.3VDC	6.3VAC	0V	140VDC	140VDC	.3VDC		
V 6	6AG5	-.7VDC	.4VDC	6.3VAC	0V	117VDC	140VDC	.4VDC		
V 7	6AG5	0V	1.5VDC	6.3VAC	0V	92VDC	140VDC	1.5VDC		
V 8	12AU7	¶90VDC	¶ -.1VDC	¶.1VDC	6.3VAC	6.3VAC	¶270VDC	¶90VDC	¶97VDC	0V
V 9	6BA6	0V	0V	6.3VAC	0V	150VDC	150VDC	0V		
V 10	6BA6	0V	0V	6.3VAC	0V	140VDC	145VDC	1.5VDC		
V 11	6AU6	-.3VDC	0V	6.3VAC	0V	60VDC	60VDC	0V		
V 12	6AL5	0V	-.2VDC	6.3VAC	0V	0V	0V	-.2VDC		
V 13	6SF7	0V	-.4VDC	0V	15VDC	.4VDC	60VDC	6.3VAC	0V	
V 14	6V6GT	0V	6.3VAC	¶260VDC	¶270VDC	¶0V	¶0V	0V	¶17VDC	
V 15	6SN7GT	▲40VDC	▲145VDC	▲55VDC	▲-4VDC	▲32VDC	▲0V	6.3VAC	0V	
V 16	6SN7GT	-.1VDC	112VDC	1.5VDC	▲40VDC	▲142VDC	▲55VDC	6.3VAC	0V	
V 17	6SN7GT	-42VDC	230VDC	2VDC	-42VDC	-42VDC	0V	0V	6.3VAC	
V 18	6SN7GT	¶-3VDC	¶45VDC ¶93VDC	¶0V	¶0V	¶300VDC	¶8VDC ¶15VDC	6.3VAC	0V	
V 19	6SN7GT	¶-.6VDC	¶100VDC	¶17VDC	¶-37VDC	¶165VDC	¶0V	6.3VAC	0V	
V 20	6BG6G	0V	6.3VAC	¶8.8VDC	¶310VDC	¶.1VDC	¶310VDC	0V	¶250VDC	TOP CAP *
V 21	5V4G	0V	300VDC	300VDC	240VDC	0V	240VDC	0V	300VDC	
V 22	1B3GT	* DO NOT MEASURE								
V 23	5U4G	0V	240VDC	0V	325VAC	0V	325VAC	0V	240VDC	
V 24	12LP4	0V	33VDC	PIN 10 280VDC	PIN 11 120VDC	PIN 12 6.3VAC				

§ Taken with vacuum tube voltmeter.
¶ Measured from pin 6 of V19.
▲ Measured from pin 6 of V15.
* Do not measure.

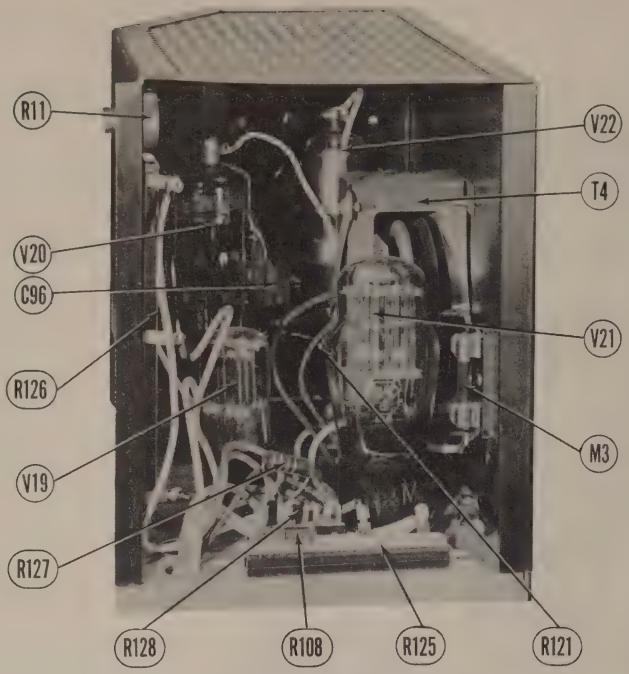
RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BH6	130KΩ	150Ω	0Ω	.1Ω	†1.5KΩ	†10KΩ	0Ω		
V 2	6AG5	1 Meg.	0Ω	0Ω	.1Ω	†1.5KΩ	†47KΩ	0Ω		
V 3	6C4	†9KΩ	Inf.	0Ω	.1Ω	†9KΩ	22KΩ	470Ω		
V 4	6AG5	17KΩ	39Ω	.1Ω	0Ω	†2.3KΩ	†2.3KΩ	39Ω		
V 5	6AG5	17KΩ	39Ω	.1Ω	0Ω	†2KΩ	†2KΩ	39Ω		
V 6	6AG5	13KΩ	39Ω	.1Ω	0Ω	†47KΩ	†2KΩ	39Ω		
V 7	6AG5	.2Ω	150Ω	.1Ω	0Ω	†8KΩ	†2KΩ	150Ω		
V 8	12AU7	2.7KΩ	¶3.3KΩ	¶10Ω	.1Ω	.1Ω	†4.7KΩ	2.7KΩ	¶7KΩ	0Ω
V 9	6BA6	.1Ω	0Ω	.1Ω	0Ω	†3.2KΩ	†3.2KΩ	100Ω		
V 10	6BA6	470KΩ	0Ω	.1Ω	0Ω	†2.2KΩ	†8KΩ	100Ω		
V 11	6AU6	22KΩ	0Ω	.1Ω	0Ω	†7KΩ	†7KΩ	0Ω		
V 12	6AL5	200KΩ	100KΩ	.1Ω	0Ω	0Ω	0Ω	100KΩ		
V 13	6SF7	0Ω	15 Meg.	0Ω	†1 Meg.	120KΩ	†220KΩ	.1Ω	0Ω	
V 14	6V6GT	Inf.	.1Ω	†2KΩ	†1.8KΩ	♦470KΩ	¶0Ω	0Ω	680Ω	
V 15	6SN7GT	13KΩ	†8KΩ	1.3 Meg.	750KΩ	22KΩ	▲0Ω	.1Ω	0Ω	
V 16	6SN7GT	1 Meg.	†20KΩ	220Ω	13KΩ	†35KΩ	▲680KΩ	.1Ω	0Ω	
V 17	6SN7GT	3.9 Meg.	†220Ω	6.8KΩ	3.9 Meg.	3.9 Meg.	0Ω	0Ω	.1Ω	
V 18	6SN7GT	1.1 Meg.	#2.6Meg. #1.4Meg.	¶0Ω	¶2.2Meg.	†2.2KΩ	¶5.5KΩ ¶560Ω	.1Ω	0Ω	
V 19	6SN7GT	800KΩ	†120KΩ	¶350KΩ	¶220KΩ	#130KΩ	¶0Ω	.1Ω	0Ω	
V 20	6BG6G	Inf.	.1Ω	¶80Ω	†220Ω	1 Meg.	†220Ω	0Ω	†5KΩ	TOP CAP #150Ω
V 21	5V4G	Inf.	360KΩ	360KΩ	†34Ω	Inf.	†34Ω	Inf.	360KΩ	
V 22	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP #500Ω
V 23	5U4G	Inf.	8KΩ	Inf.	♦28Ω	Inf.	♦30Ω	Inf.	8KΩ	
V 24	12LP4	0Ω	†1.5Meg.	PIN 10 #56KΩ	PIN 11 15KΩ	PIN 12 .1Ω				

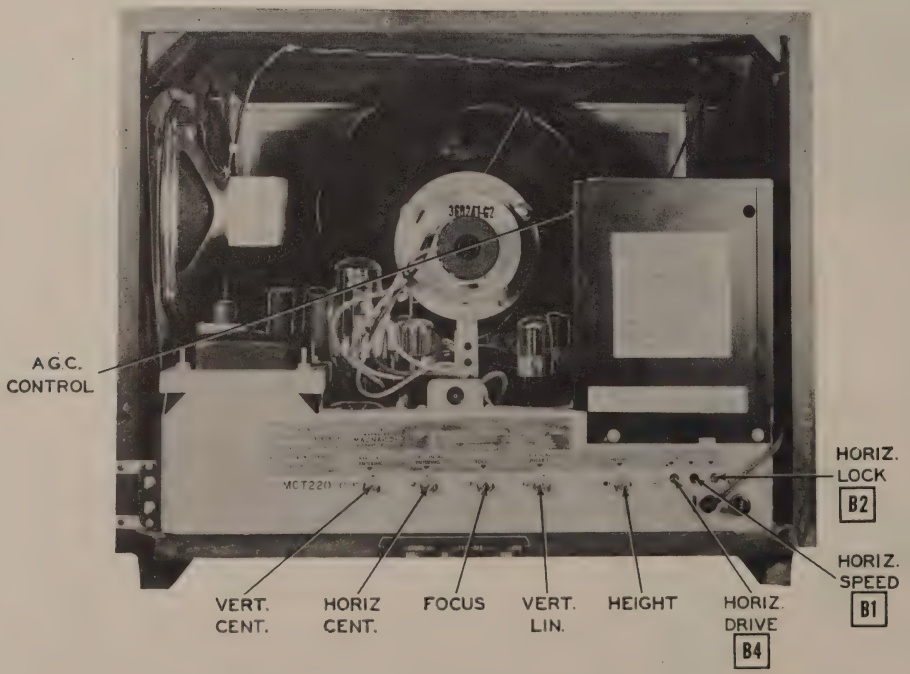
† Measured from pin 8 of V23.
# Measured from pin 8 of V21.
♦ Measured from center-tap of HV winding.
¶ Measured from pin 6 of V19.
▲ Measured from pin 6 of V15.
Note. AGC threshold control set at maximum for these measurements.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.

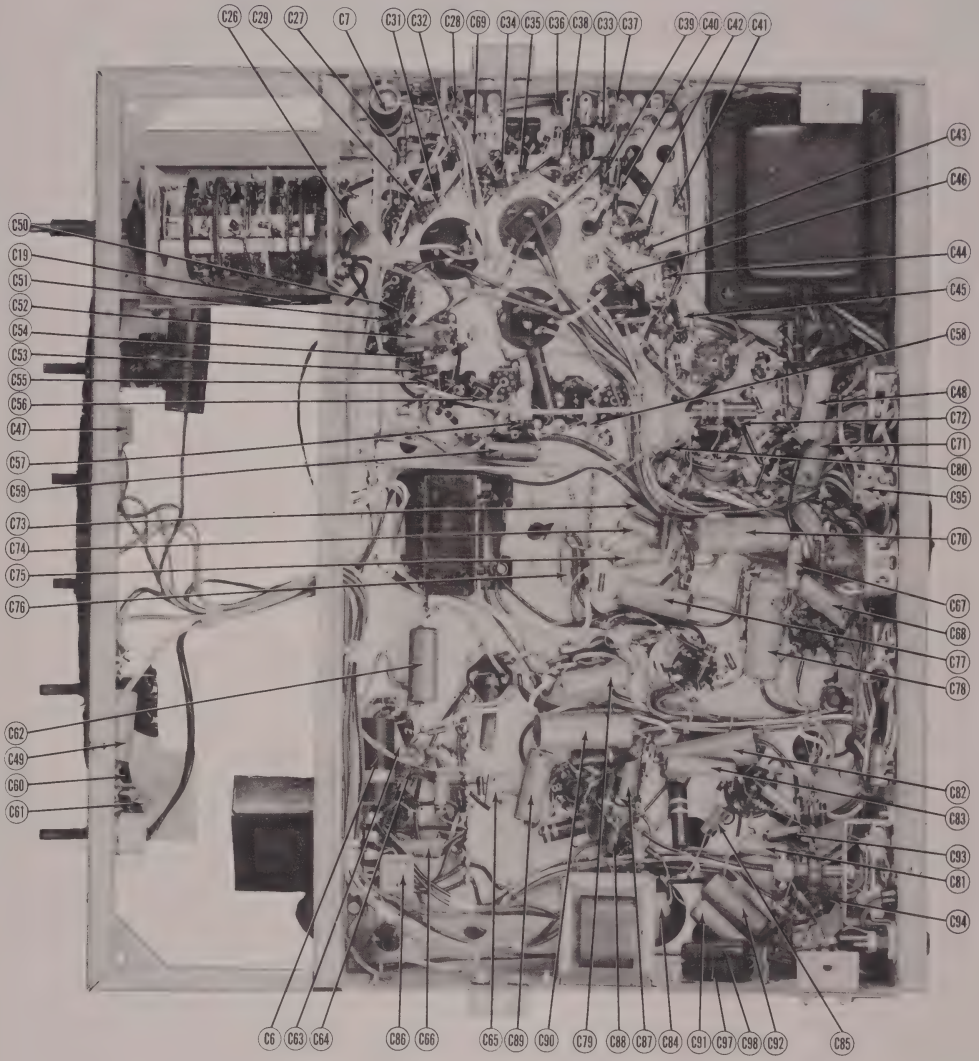
CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION



HIGH VOLTAGE SUPPLY

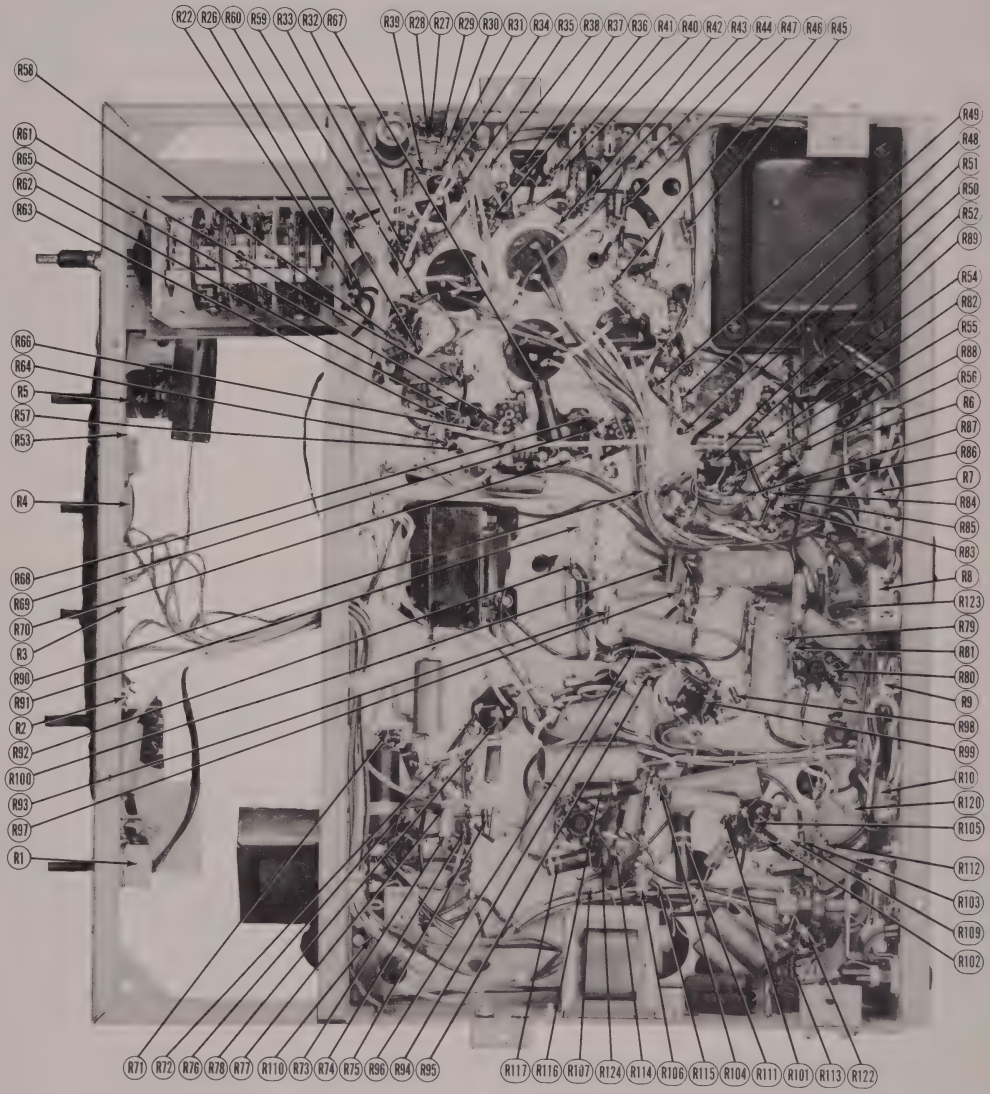


CABINET-REAR VIEW



CHASSIS BOTTOM VIEW–CAPACITOR IDENTIFICATION

MAGNAVOX CHASSIS
CT-219, CT-220, CT-222



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

MAGNAVOX CHASSIS
CT-219, CT-220, CT-222

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Check of horizontal hold control.

1. Turn the set on and allow 5 minute warm up period.
2. Turn the horizontal hold control from maximum counter-clockwise position. The picture should remain in synchronization. Return the control to its extreme counter-clockwise position and momentarily remove the signal by switching to another channel and back again. The picture should be out of synchronization and shown 4 or 5 bars slanting upward to the right.
3. If this condition does not occur adjust the horizontal speed slug (B1) until the condition described in step 3 occurs. Complete horizontal oscillator alignment.

If the receiver failed the above check, and adjustment of B1 will not correct it, complete horizontal oscillator alignment must be performed as follows.

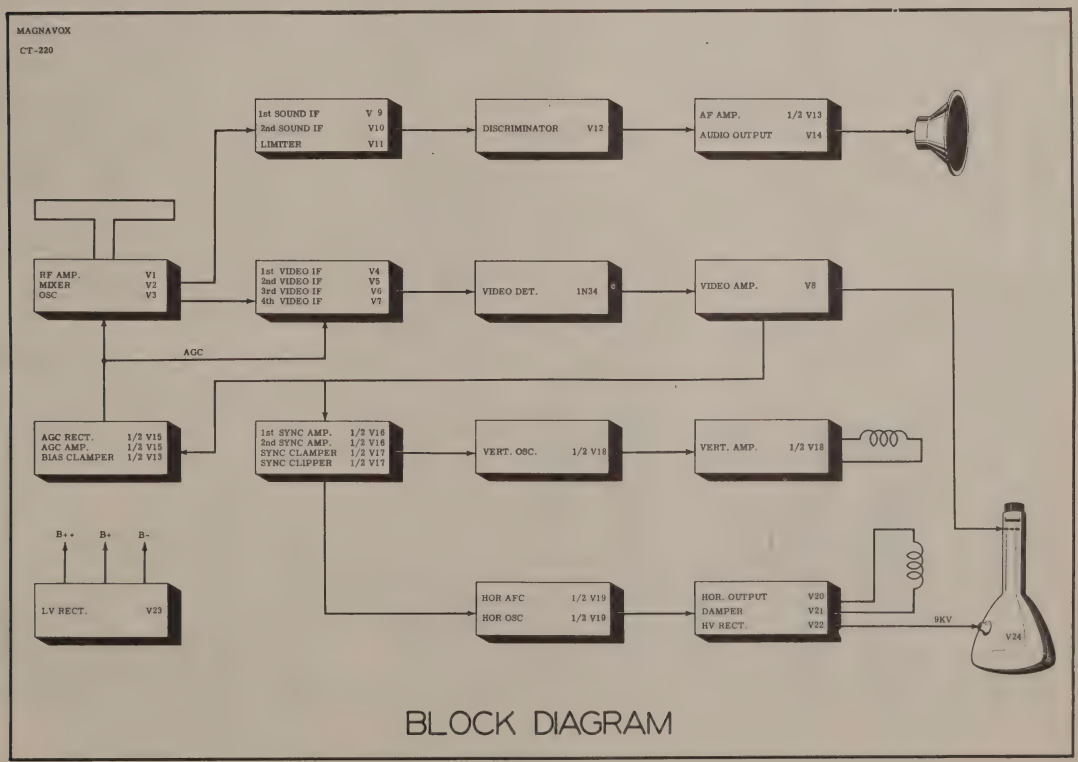
1. Turn the horizontal hold control to maximum clockwise.
2. Adjust the horizontal lock trimmer (B2) two turns counter-clockwise from tight.
3. Short circuit the horizontal speed coil (B1).
4. Adjust the horizontal frequency slug (B3) to synchronize the picture horizontally.
5. Remove the short from the horizontal speed coil and adjust B1 to obtained the condition described above under horizontal hold control check.

HORIZONTAL LINEARITY ADJUSTMENTS

Adjust the horizontal drive trimmer (B4) for proper width of picture with best linearity.
Adjust the horizontal linearity slug (B5) for best linearity of the right side of the picture. Slight readjustment of B4 may be necessary for optimum results.

AUTOMATIC GAIN CONTROL ADJUSTMENTS

The AGC threshold control R11 is located on the side of the high voltage power supply cover.
Shop Adjustment.
Turn the set on and tune in a local TV station.
Connect the vertical amp. input of an oscilloscope to the picture tube grid, (pin 2, V24). Connect the low side to chassis.
Turn the contrast control to maximum clockwise.
Adjust the AGC threshold control to obtain a 40 volt peak to peak signal on the oscilloscope.
Field adjustment.
Turn the set on and tune in a local TV station.
Set the contrast control to the mid-position of its range.
Using the brightness control and the AGC threshold control adjust a medium brightness picture with proper contrast.



BLOCK DIAGRAM

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1A	RF Amp.	6BH6	6BH6	7CM	
B	RF Amp.	6J6	6J6	7BF	
V2A	Mixer	6AG5	6AG5	7BD	
B	Mixer	6J6	6J6	7BF	
V3A	Osc.	6C4	6C4	6BG	
B	Osc.	6J6	6J6	7BF	
C	Osc.	6AB4	6AB4		
V4	1st Video IF Amp.	6AG5	6AG5	7BD	
V5	2nd Video IF Amp.	6AG5	6AG5	7BD	
V6	3rd Video IF Amp.	6AG5	6AG5	7BD	
V7	4th Video IF Amp.	6AG5	6AG5	7BD	
V8	Video Amp.	12AU7	12AU7	9A	
V9	1st Sound IF Amp.	6BA6	6BA6	7BK	
V10	2nd Sound IF Amp.	6BA6	6BA6	7BK	
V11	Limiter	6AU6	6AU6	7BK	
V12	Disc.	6AL5	6AL5	6BT	
V13	AF Amp.-Bias Clamper	6SF7	6SF7	7AZ	
V14	Audio Output	6V6GT	6V6GT	7AC	
V15	AGC Amp.-AGC Rectifier	6SN7GT	6SN7GT	8BD	
V16	Sync. Amp.	6SN7GT	6SN7GT	8BD	
V17	Sync. Clamper-Sync. Clipper	6SN7GT	6SN7GT	8BD	
V18	Vert. Osc.-Vert. Amp.	6SN7GT	6SN7GT	8BD	
V19	Hor. AFC-Hor. Osc.	6SN7GT	6SN7GT	8BD	
V20	Hor. Output	6BG6G	6BG6G	5BT	
V21	Damper	5V4G	5V4G	5L	
V22	HV Rectifier	1B3GT	1B3GT	8C	
V23	LV Rectifier	5U4G	5U4G	5T	
V24A	Picture Tube	12LP4	12LP4	12D	
B	Picture Tube	12KP4	12KP4	12D	
C	Picture Tube	10BP4	10BP4	12D	
D	Picture Tube	10FP4	10FP4	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	30	475	270021-15	AF682X	UP4450		TVL-40†	▲ Filter
B	40	475			BR850A			■ Filter
C	10	475						▲ Decoupling
C2A	40	475	270021-14	AF822X	UP9CJ983		TVL-40	▲ Filter
B	10	475						■ Decoupling
C	10	475						▲ Vert. Output Decoupling
C3A	72	475	270021-16	AF15X10B	UP8050		TVL-18	▲ Filter
B	50	50			BR505			▲ Vert. Output Cath. Bypass
C4A	30	475	270021-13	AF662X	UP4450		TVL-55	▲ Filter
B	30	475			BR850A			■ Filter
C	10	475						▲ Filter
C5A	30	475	270021-20	AF62X	UP7BJ912		TVL-69	▲ Output Decoupling
B	10	475						▲ Decoupling
C6	20	150	270027-6	PRS150/20	BR2015A		TVA-18	Output Cathode Bypass
C7	25	50	270027-7	PRS50/25	BR252A		TVA-15	AGC Filter
C8	680					GP2K-680		RF Coupling
C9	680					GP2K-680		RF Screen Bypass
C10	680					GP2K-680		RF Cathode Bypass
C11	680					GP2K-680		AGC Filter
C12	680					GP2K-680		RF Plate Decoupling
C13	.68							RF Coupling
C14	.47							RF Coupling
C15	1.5					NPOK-1.5		RF Coupling
C16	25					GP1K-25		RF Coupling
C17	1.5					NPOK-1.5		Osc. Coupling
C18	5000					811-005	29C1	Mixer Screen Bypass
C19	1500					GP2L-0015		Mixer Plate Decoupling
C20	3					NPOK-3		Osc. Feedback
C21	680					GP2K-680		Osc. Feedback
C22	680					GP2K-680		Osc. Filament Bypass
C23	680					GP2K-680		RF Bypass
C24	680					GP2K-680		RF Bypass
C25	68	500						Fixed Trimmer
C26	270	500		1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C27	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	AGC Filter
C28	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	RF Bypass
C29	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	1st V. IF Decoupling
C30	43							Fixed Trimmer
C31	270		250088-45	1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C32	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	AGC Filter
C33	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	RF Bypass
C34	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	2nd V. IF Decoupling
C35	270		250088-45	1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C36	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	AGC Filter
C37	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	RF Bypass
C38	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	3rd V. IF Decoupling
C39	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	3rd V. IF Fil. Bypass
C40	270		250088-45	1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C41	75	500	250159-44	1468-000075	5W5T1	GP1K-75	1FM-475	4th V. IF Cath. Bypass
C42	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	4th V. IF Decoupling
C43	270		250088-45	1468-00025	5W5T25	GP2K-270	1FM-325	IF Coupling
C44	5		250088-44	1469-000005	5R5V5	NPOK-5	MS-55	Fixed Trimmer
C45	10	500	250159-92	1468-00001	5W5Q1	GP1K-10	MS-41	V. Diode Filter
C46	1000		250088-46	1468-001	1W5D1	GP2L-001	1FM-21	RF Bypass
C47	560	500	250160-61	1468-0005	1W5T6	GP2K-560	1FM-35	2nd V. Amp. Cath. Bypass
C48	.05	400	250151-24	P488-05	GT435		TM-15	Video Coupling

CAPA

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEME: MAGNAVOX PART No.	REPLACEME: AEROVOX PART No.	CO DI PA
C49	.1	400	250151-22	P488-1	GT
C50	1000		250088-46	1468-001	1W5
C51	1000		250088-46	1468-001	1W5
C52	.01	600	250151-38	P688-01	GT
C53	1000		250088-46	1468-001	1W5
C54	1000		250088-46	1468-001	1W5
C55	1000		250088-46	1468-001	1W5
C56	36		250088-43	1468-00004	5W5
C57	1000		250088-46	1468-001	1W5
C58	270	500	250159-87	1468-00025	5W5
C59	.01	400	250151-27	P488-01	GT
C60	270	500	250159-87	1468-00025	5W5
C61	.01	400	250151-27	P488-01	GT
C62	.1	400	250151-22	P488-1	GT
C63	.001	600	250151-45	P688-001	GT
C64	.003	600	250151-43	P688-003	GT
C65	47	500	250159-78	1468-00005	5W5
C66	.005	600	250151-41	P688-005	GT
C67	.002	600	250151-44	P688-002	GT
C68	.05	400	250151-24	P488-05	GT
C69	.05	400	250151-24	P488-05	GT
C70	.25	400	250172-2	P488-25	GT
C71	.05	400	250151-24	P488-05	GT
C72	100	500	250159-98	1468-0001	5W
C73	.002	600	250151-44	P688-002	GT
C74	.005	400	250151-30	P688-005	GT
C75	.005	400	250151-30	P688-005	GT
C76	4700	500	250161-24	1467-005	1D5
C77	.1	400	250151-22	P488-1	GT
C78	.25	400	250151-21	P488-25	GT
C79	.03	600	250151-36	P688-03	GT
C80	180	500	250159-85	1468-0002	5W5
C81	.002	600	250151-44	P688-002	GT
C82	.25	400	250151-21	P488-25	GT
C83	.02	400	250151-26	P488-02	GT
C84	.05	600	250151-35	P688-05	GT
C85	180	500	250159-85		
C86	10000	300	250161-53	1467-01	1D3
C87	2200	500	250160-46		
C88	390	500	250159-89	1468-0004	5W5
C89	.05	600	250151-35	P688-05	GT
C90	.25	400	250172-2	P488-25	GT
C91	.03	600	250153-36	P688-03	GT
C92	.05	600	250151-35	P688-05	GT
C93	120	500	250159-83	1468-00015	5W5
C94	5	500	250159-91	1468-000005	5W5
C95	270	500	250159-87	1468-00025	5W5
C96	500	15000	250173-1		
C97	.05	400	250129-15	P488-05	GT
C98	.05	400	250129-15	P488-05	GT

* Not used in suffix "A" chassis models.
† Parallel sections to obtain desired capacity.

C

ITEM No.	RATING: RESIST-ANCE	RATING: WATTS	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	CI P
R1A	1 Meg.	½	220076-8	Q13-137	M-
B	Switch		Not Req.	76-1	SW
R2	50KΩ	½	220076-7	Q11-123	M-
R3	1 Meg.	½	220076-12	Q11-137	M-
R4	50KΩ	½	220076-15 or 220076-11	Q11-123	M-
R5	10KΩ	½	220076-14		
R6	30Ω	2	220076-10	W-30X15	43
R7	30Ω	4	220076-9		10-
R8	2200Ω	4	220076-1		10-
R9	5000Ω	4	220076-3		M-
R10	2.5 Meg.	½	220076-5	Q11-239	M-
R11	200KΩ	½	220076-13		M-

R

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART N
R12	1000Ω	½		BTS-1000
R13	1000Ω	½		BTS-1000
R14	330Ω	½		
R15	22KΩ	½		
R16	150Ω	½		
R17	10KΩ	½		
R18	1000Ω	½		BTS-1000
R19	4700Ω	½		BTS-4700
R20	1 Meg.	½		
R21	47KΩ	½		BTS-47K
R22	1000Ω	½		BTS-1000
R23	22KΩ	½		BTS-22K
R24	470Ω	½		
R25	6800Ω	1		
R26	1000Ω	½	230084-13	BTS-1000
R27	2.2 Meg.	½	230084-33	BTS-2.2 M
R28	100KΩ	½	230084-25	BTS-100K
R29	18KΩ 10%	½	230084-77	BTS-18K
R30	5600Ω 10%	½	230084-71	BTS-5600
R31	1000Ω 10%	½	230084-62	BTS-1000
R32	10KΩ 10%	½	230084-74	
R33	39Ω 10%	½	230084-45	
R34	1000Ω 10 %	½	230084-62	BTS-1000
R35	10KΩ 10%	½	230084-74	
R36	39Ω 10%	½	230084-45	

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1A	RF Amp	5BH6	6BH6	7CM	
B	RF Amp.	6J6	6J6	7BF	
V2A	Mixer	6AG5	6AG5	7BD	
B	Mixer	6J6	6J6	7BF	
V3A	Osc	6C4	6C4	6BG	
B	Osc	6J6	6J6	7BF	
C	Osc	6AT4	6AB4		
V4	1st Video-IF Amp	6AG5	6AG5	7BD	
V5	2nd Video-IF Amp	6AG5	6AG5	7BD	
V6	3rd Video-IF Amp	6AG5	6AG5	7BD	
V7	4th Video-IF Amp	6AG5	6AG5	7BD	
V8	Video Amp.	12AU7	12AU7	9A	
V9	1st Sound IF Amp.	6BA6	6BA6	7BK	
V10	2nd Sound IF Amp.	6BA6	6BA6	7BK	
V11	Limiter	6AL6	6AL6	7BK	
V12	Disc	6AL5	6AL5	6BT	
V13	AF Amp.-Bias Clamper	6SF7	6SF7	7AZ	
V14	Audio Output	6V6GT	6V6GT	7AC	
V15	AGC Amp.-AGC Rectifier	6SN7GT	6SN7GT	8BD	
V16	Sync. Amp.	6SN7GT	6SN7GT	8BD	
V17	Sync. Clamper-Sync. Clipper	6SN7GT	6SN7GT	8BD	
V18	Vert. Osc.-Vert. Amp.	6SN7GT	6SN7GT	8BD	
V19	Hor AFC-Hor Osc	6SN7GT	6SN7GT	8BD	
V20	Hor. Output	6BG6G	6BG6G	5BT	
V21	Damper	5Y4G	5Y4G	5L	
V22	HV Rectifier	1B3GT	1B3GT	8C	
V23	LV Rectifier	5U4G	5U4G	5T	
V24A	Picture Tube	12LP4	12LP4	12D	
B	Picture Tube	12EP4	12EP4	12D	
C	Picture Tube	10BP4	10BP4	12D	
D	Picture Tube	10FP4	10FP4	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	30	475	270021-15	AF682X	UP4450		TVL-401	▲ Filter
B	30	475			BBR50A			■ Filter
C	10	475						▲ Decoupling
C3A	10	475	270021-14	AF822X	UP9CJ983		TVL-40	▲ Filter
B	10	475						■ Decoupling
C	10	475						▲ Vert. Output Decoupling
C3A	72	475	270021-16	AF15X10B	UP8050		TVL-18	▲ Filter
B	50	50			BR505			▲ Vert. Output Cath. Bypass
C4A	30	475	270021-13	AF562X	UP4450		TVL-55	▲ Filter
B	30	475			BBR50A			▲ Decoupling
C	10	475						▲ Filter
C5A	30	475	270021-20	AF82X	UP7BJ912		TVL-69	▲ Filter
B	10	475						▲ Decoupling
C6	.20	150	270027-6	PRS150.20	BR2015A		TVA-18	Output Cathode Bypass
C7	.25	50	270027-7	PRS50.25	BR252A		TVA-15	AGC Filter
C8	680					GP2K-680		RF Coupling
C9	680					GP2K-680		RF Screen Bypass
C10	680					GP2K-680		RF Cathode Bypass
C11	680					GP2K-680		AGC Filter
C12	680					GP2K-680		RF Plate Decoupling
C13	.68							RF Coupling
C14	.47							RF Coupling
C15	1.5						NPOK-1.5	RF Coupling
C16	25						GP1K-25	RF Coupling
C17	1.5						NPOK-1.5	Osc. Coupling
C18	5000						81L-005	Mixer Screen Bypass
C19	1500						GP2L-0015	Mixer Plate Decoupling
C20	3						NPOK-3	Osc. Feedback
C21	680						GP2K-680	Osc. Feedback
C22	680						GP2K-680	Osc. Filament Bypass
C23	680						GP2K-680	RF Bypass
C24	680						GP2K-680	RF Bypass
C25	68	500						Fixed Trimmer
C26	270	500		1468-00025	5W5T25	GP2K-270	IFM-325	IF Coupling
C27	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	AGC Filter
C28	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	RF Bypass
C29	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	1st V. IF Decoupling
C30	43							Fixed Trimmer
C31	270		250088-45	1468-00025	5W5T25	GP2K-370	IFM-325	IF Coupling
C32	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	AGC Filter
C33	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	RF Bypass
C34	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	2nd V. IF Decoupling
C35	270		250088-45	1468-00025	5W5T25	GP2K-270	IFM-325	IF Coupling
C36	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	AGC Filter
C37	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	RF Bypass
C38	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	3rd V. IF Decoupling
C39	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	3rd V. IF Fil. Bypass
C40	270		250088-45	1468-00025	5W5T25	GP2K-270	IFM-325	IF Coupling
C41	75	500	250159-44	1468-000075	5W5T1	GP1K-75	IFM-475	4th V. IF Cath. Bypass
C42	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	4th V. IF Decoupling
C43	270		250088-45	1468-00025	5W5T25	GP2K-270	IFM-325	IF Coupling
C44	5		250088-44	1468-000005	5R5Y5	NPOK-5	MS-35	Fixed Trimmer
C45	39	500	250159-52	1468-00001	5W5Q1	GP1K-10	MS-41	V. Diode Filter
C46	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	RF Bypass
C47	560	500	250160-61	1468-0005	1W5T6	GP2K-560	IFM-35	2nd V. Amp. Cath. Bypass
C48	.05	400	250151-34	1488-05	GT485		TIM-15	Video Coupling

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C49	.1	400	250151-22	P488-1	GT4P1		TM-1	Pic. Tube Cath. Decoupling
C50	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	1st S. IF Cath. Bypass
C51	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	1st. S. IF Decoupling
C52	.01	600	250151-38	P488-01	GT6S1	GP2-335-01	TM-11	2nd S. IF Grid Filter
C53	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	2nd S. IF Cath. Bypass
C54	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	2nd S. IF Screen Bypass
C55	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	2nd S. IF Plate Decoupling
C56	36		250088-43	1468-00004	5W5Q4	GP1K-39	IFM-44	Limiter Grid Filter
C57	1000		250088-46	1468-001	1W5D1	GP2L-001	IFM-21	Limiter Decoupling
C58	270	500	250159-87	1468-00025	5W5T25	GP2K-270	IFM-325	RF Bypass
C59	.01	400	250151-27	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C60	270	500	250159-87	1468-00025	5W5T25	GP2K-270	IFM-325	Tone Compensation *
C61	.01	400	250151-27	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C62	.1	400	250151-22	P488-1	GT4P1		TM-1	AF Screen Bypass
C63	.001	600	250151-45	P488-001	GT6D1	GP2M-001	TM-21	De-emphasis
C64	.003	600	250151-43	P688-003	GT6D3	GP2M-003	TM-23	Audio Coupling
C65	.47	500	250159-78	1468-00005	5W5Q5	GP1K-47	IFM-45	AF Feedback
C66	.005	600	250151-41	P688-005	GT6D5	GP2M-005	TM-25	Output Plate Bypass
C67	.002	600	250151-44	P688-002	GT6D2	GP2M-002	TM-22	AGC Filter
C68	.05	400	250151-34	P488-05	GT4S5		TM-15	AGC Filter
C69	.05	400	250151-34	P488-05	GT4S5		TM-15	AGC Filter
C70	.25	400	250172-2	P488-25	GT4P25		TC-2	1st Sync. Amp. Cath. Bypass
C71	.05	400	250151-24	P488-05	GT4S5		TM-15	Sync. Coupling
C72	100	500	250159-98	1468-0001	5W5T1	GP1K-100	IFM-31	Sync. Coupling
C73	.002	600	250151-44	P688-002	GT6D2	GP2M-002	TM-22	Integrator Net.
C74	.005	400	250151-30	P688-005	GT9D5	GP2M-005	TM-25	Integrator Net.
C75	.005	400	250151-30	P688-005	GT6D5	GP2M-005	TM-25	Integrator Net.
C76	4700	500	250161-24	1467-005	1D5D5	GP2M-0047	IFM-25	Vert. Osc. Grid Cap.
C77	.1	400	250151-22	P488-1	GT4P1		TM-1	Vert. Discharge
C78	.25	400	250151-21	P488-25	GT4P25		TC-2	Vert. Sweep Coupling
C79	.03	600	250151-36	P686-03	GT6S3		TM-13	Vert. Cent. Cont. Bypass
C80	.180	500	250159-85	1468-0002	5W5T2	GP2K-180	IFM-32	Hor. Sync. Coupling
C81	.002	600	250151-44	P688-002	GT6D2	GP2M-002	TM-22	Hor. Sync. Coupling
C82	.33	400	250151-21	P488-25	GT4P25		TC-2	AFC Filter
C83	.02	400	250151-26	P488-02	GT4S2		TM-12	AFC Filter
C84	.05	600	250151-35	P688-05	GT4S5		TM-15	AFC Plate Bypass
C85	.180	500	250159-85			GP2K-180		Hor. Osc. Grid Cap.
C86	10000	300	250161-53	1467-01	1D3S1	GP2-335-01	IFM-11	Fixed Trimmer
C87	.002	500	250160-46			GP2M-0022		Hor. Discharge
C88	390	500	250159-89	1468-0004	5W5T4	GP2K-390	IFM-34	Hor. Sweep Coupling
C89	.05	600	250151-35	P688-05	GT6S5		TM-15	Hor. Output Screen Bypass
C90	.25	400	250172-2	P488-25	GT4P25		TC-2	Hor. Output Cathode Bypass
C91	.03	600	250153-36	P686-03	GT6S3		TM-13	Damper Filter
C92	.05	600	250151-35	P686-05	GT6S5		TM-15	Damper Filter
C93	120	500	250159-83	1468-00015	5W5T15	GP2K-120	IFM-315	AFC Filter
C94	5	500	250159-91	1468-000005	5W5Y5	NPOK-5	MS-35	Hor. Feedback
C95	270	500	250159-87	1468-00025	5W5T25	GP2K-270	IFM-325	Hor. Cent. Cont. Bypass
C96	500	15000	250173-1			410-500		HV Filter
C97	.05	400	250129-15	P488-05	GT4S5		TM-15	Line Filter
C98	.05	400	250129-15	P488-05	GT4S5		TM-15	Line Filter

* Not used in suffix "A" chassis models.
† Parallel sections to obtain desired capacity.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	220078-8	Q13-137	M-63-Z	Volume control
B	Switch		Not Req.	76-1	SW-A	Attach to R1A per Instructions
R2	220Ω	½	220078-1	Q11-123	M-44-S	Brightness control
R3	1 Meg.	½	220078-12	Q11-137	M-61-S	Vert. hold control
R4	50KΩ	½	220078-15 or 220078-16	Q11-123	M-44-S	Horiz. hold control
R5	10KΩ	½	220078-14			Contrast control
R6	30Ω	2	220078-10	W-30X15	43-30CT	Vert. centering control, tapped at 15Ω
R7	30Ω	4	220078-9		10-30	Horiz. centering control, Wire Wound
R8	2200Ω	4	220078-1		10-2500	Focus control, Wire Wound
R9	2000Ω	4	220078-3		M-18-S	Vert. linearity control
R10	2.5 Meg.	½	220078-5	Q11-239	M-84-S	Height control
R11	300KΩ	½	220078-13		M-52-S	AGC threshold control

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
					ALL RESISTORS ARE ± 20% UNLESS OTHERWISE STATED.
R12	1000Ω	½		BTS-1000	Ant. Loading See Note 1
R13	1000Ω	½		BTS-1000	Ant. Loading See Note 1
R14	330Ω	½			Ant. Loading See Note 1
R15	22KΩ	½			RF Grid
R16	150Ω	½			RF Cathode
R17	10KΩ	½			RF Screen
R18	1000Ω	½		BTS-1000	RF Plate Decoupling
R19	4700Ω	½		BTS-4700	Mixer Grid Coil Shunt
R20	1 Meg.	½			Mixer Grid
R21	47KΩ	½		BTS-47K	Mixer Screen
R22	1000Ω	½		BTS-1000	Mixer Plate Decoupling
R23	22KΩ	½		BTS-22K	Osc. Grid
R24	470Ω	½			Osc. Cathode
R25	6800Ω	½			Osc. Plate
R26	1000Ω	½	2300084-13	BTS-1000	Osc. Plate Decoupling
R27	2.2 Meg.	½	2300084-33	BTS-2.2 Meg.	Voltage Divider
R28	100KΩ	½	2300084-25	BTS-100K	Voltage Divider
R29	18KΩ 10%	½	2300084-77	BTS-18K	AGC Network
R30	5800Ω 10%	½	2300084-71	BTS-5800	AGC Network
R31	1000Ω 10%	½	2300084-62	BTS-1000	AGC Network
R32	10KΩ 10%	½	2300084-74		1st Video IF Grid
R33	39Ω 10%	½	2300084-45		1st Video IF Cathode
R34	1000Ω 10 %	½	2300084-62	BTS-1000	1st Video IF Decoupling
R35	10KΩ 10%	½	2300084-74		2nd Video IF Grid
R36	39Ω 10%	½	2300084-45		2nd Video IF Cathode

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R37	10000Ω 10%	½	2300084-62	BTS-1000	2nd Video IF Decoupling
R38	150Ω 10%	½	2300084-53		Decoupling Network
R39	10000Ω 10%	½	2300084-62	BTS-1000	AGC Network
R40	4700Ω 10%	½	2300084-70		3rd Video IF Grid
R41	39Ω 10%	½	2300084-45		3rd Video IF Cathode
R42	2700Ω 10%	½	2300084-67	BTS-2700	3rd Video IF Plate
R43	10000Ω 10%	½	2300084-62	BTS-1000	3rd Video IF Decoupling
R44	150Ω 10%	½	2300084-52		Decoupling Network
R45	150Ω 10%	½	2300084-52		4th Video IF Cathode
R46	56000Ω 10%	½	2300084-71		4th Video IF Plate
R47	10000Ω	½	2300084-13	BTS-1000	4th Video IF Decoupling
R48	33000Ω 10%	½		BTS-3300	Video Det. Load See Note 2
R49	10Ω	1	2300084-1		Bias Network
R50	68KΩ 10%	½	2300085-84	BTA-68K	Video Amp. Plate
R51	2700Ω 10%	½	2300084-67	BTS-2700	Video Amp. Grid
R52	18KΩ 10%	2	2300086-74	BT-2-18K	Video Amp. Cathode
R53	220Ω 10%	½	2300084-54	BW-½-220	Voltage Divider
R54	4700Ω 10%	½	2300085-70	BTA-4700	Video Amp. Plate
R55	2.2 Meg.	½	2300084-33	BTS-2.2 Meg.	Voltage Divider
R56	2.2 Meg.	½	2300084-33	BTS-2.2 Meg.	Picture Tube Grid
R57	12KΩ 10%	½	2300084-75	BTS-12K	Voltage Divider
R58	100Ω	½	2300084-7		1st Sound IF Cathode
R59	2200Ω	½	2300084-15	BTS-2200	1st Sound IF Decoupling
R60	470KΩ	½	2300084-29		2nd Sound IF Grid
R61	100Ω	½	2300084-7		2nd Sound IF Cathode
R62	6800Ω	½	2300084-18		2nd Sound IF Screen
R63	22KΩ	½	2300084-31		2nd Sound IF Transformer Shunt
R64	100KΩ	½	2300084-13	BTS-1000	2nd Sound IF Plate Decoupling
R65	22KΩ	½	2300084-31		Limiter Grid
R66	10KΩ	½	2300085-19		Limiter Decoupling
R67	10KΩ	2	2300086-74	BT-2-10K	Voltage Divider
R68	100KΩ	½	2300084-25	BTS-100K	Disc. Diode Load
R69	100KΩ	½	2300084-25	BTS-100K	Disc. Diode Load
R70	100KΩ	½	2300084-25	BTS-100K	De-emphasis See Note 3
R71	15 Meg.	½	2300084-256	BTS-15 Meg.	AF Grid
R72	1 Meg.	½	2300084-31	BTS-1 Meg.	AF Screen
R73	220KΩ 10%	½	2300085-90	BTA-220K	AF Plate
R74	1 Meg.	½	2300084-31	BTS-1 Meg.	Feedback
R75	1 Meg.	½	2300084-31	BTS-1 Meg.	Feedback
R76	470KΩ	½	2300084-29	BTS-470K	Output Grid
R77	680Ω 10%	2	2300086-50	BT-2-680	Output Cathode
R78	1500Ω	2	2300086-14	BT-2-1500	Filter
R79	470KΩ 10%	½	2300084-29	BTS-470K	AGC Amp. Grid
R80	270KΩ 10%	½	2300084-91	BTS-270K	AGC Amp. Plate
R81	560KΩ 10%	½	2300084-95	BTS-560K	AGC Det. Cathode
R82	10KΩ	½	2300084-19	BTS-10K	Sync. Amp. Grid
R83	680KΩ	½	2300084-30	BTS-680K	Sync. Amp. Cathode
R84	27KΩ 10%	½	2300084-79	BTA-27K	Sync. Amp. Plate
R85	1 Meg.	½	2300084-31	BTS-1 Meg.	Sync. Amp. Grid
R86	22KΩ 10%	½	2300084-54	BW-½-220	Sync. Amp. Cathode
R87	22KΩ 10%	½	230085-78	BTA-22K	Sync. Amp. Plate
R88	3.9 Meg. 10%	½	2300084-105	BTS-3.9 Meg.	Sync. Clipper Grid
R89	680KΩ	½	2300084-18	BTS-680K	Sync. Clipper Cathode
R90	3300Ω	½	2300084-16	BTS-3300	Integrator
R91	82000Ω 10%	½	2300084-73	BTS-8200	Integrator
R92	82000Ω 10%	½	2300084-73	BTS-8200	Integrator
R93	1 Meg. 5%	½	2300084-31	BTS-1 Meg. -5%	Vert. Osc. Grid
R94	4.7 Meg.	½	2300084-35	BTS-4.7 Meg.	Voltage Divider
R95	100KΩ	½	2300084-25	BTS-100K	Voltage Divider
R96	1.5 Meg.	½	2300084-32	BTS-1.5 Meg.	Vert. Osc. Plate
R97	330KΩ	½	2300084-16	BTS-3300	Vert. Peaking
R98	2.2 Meg.	½	2300084-33	BTS-2.2 Meg.	Vert. Output Grid
R99	1500Ω 10%	1	2300085-59	BTA-1500	Vert. Output Cathode
R100	1000Ω	1	2300085-13	BTA-1000	Vert. Output Plate Decoupling
R101	560KΩ 5%	½	2300094-225	BTS-560K-5%	Horiz. AFC Grid
R102	180KΩ 5%	½	2300094-213	BTS-180K-5%	Horiz. AFC Cathode
R103	150KΩ 5%	½	2300085-211	BTA-150K-5%	Horiz. AFC Cathode
R104	8200Ω 10%	½	2300084-73	BTS-8200	Horiz. AFC Filter Network
R105	3.3Meg.10%	½	2300084-104	BTS-3.3 Meg.	Voltage Divider
R106	270KΩ 10%	1	2300090-1	BTA-270K	Voltage Divider
R107	220KΩ 10%	½	2300084-87	BTS-120K	Voltage Divider
R108	38KΩ 1%	½	2300091-1 *		Voltage Divider Temp. Comp.
R109	100KΩ 1%	½	2300092-1		Horiz. Osc. Grid Temp. Comp.
R110	10KΩ 10%	½	2300084-74	BTS-10K	Horiz. Osc. Transformer Shunt
R111	120KΩ 10%	2	2300084-87	BT-2-120K	Horiz. Osc. Plate
R112	150KΩ	½	2300084-26	BTS-150K	Horiz. AFC Filter Network
R113	10KΩ	½	2300084-19	BTS-10K	Filter
R114	43Ω 5%	½	2300084-126		Parasitic Supp.
R115	1 Meg.	½	2300084-31	BTS-1 Meg.	Horiz. Output Grid
R116	82Ω 10%	2	2300086-49	BW-2-82	Horiz. Output Cathode
R117	4700Ω	2		BT-2-4700	Horiz. Output Screen See Note 4
R118	33KΩ	2	2300086-80	BT-2-33K	Horiz. Output Screen See Note 5
R119	33KΩ	2	2300086-80	BT-2-33K	Horiz. Output Screen See Note 5
R120	56KΩ 10%	½	2300084-83	BTS-56K	Filter
R121	1 Meg.	1	230085-31		HV Filter
R122	560KΩ 10%	½	2300084-95	BTS-560K	Feedback
R123	330Ω	2	2300085-10	BW-2-330	Focus Coil Shunt
R124	120Ω 10%	2	2300086-51	BW-2-120	Series Focus Coil
R125A	245Ω	10	240946-1		Voltage Divider, Wire Wound
B	550Ω	20			Voltage Divider, Wire Wound
R126A	520Ω	20	240044-1	DG-500	Voltage Divider, Wire Wound
B	520Ω	20		DG-500	Bias Network, Wire Wound
R127	6800Ω 10%	2	2300085-72	BTA-6800	Bleeder
R128	10KΩ 10%	2	2300086-74	BT-2-10K	Bleeder

Note 1. Used only in combination sets requiring FM antenna.
Note 2. Those chassis having "A" or "B" suffix use 4700Ω resistor in this application.
Note 3. Chassis having suffix "A" use 22KΩ resistor in this application.
Note 4. Not used in chassis having "D" suffix.
Note 5. Used only in those chassis having "D" suffix.

MAGNAVOX CHASSIS CT-219, CT-220, CT-222

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	MAGNAVOX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC at 2A	750VCT .260ADC	5VAC at 3A	5VAC at 2A SEC. 4 6.3VAC at 8.1A	300045-1	P-8153 §	P-3059	TP-355

§ Redrill mounting holes.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE PRI.	RATING DC RESISTANCE SEC.	REPLACEMENT DATA MAGNAVOX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	NOTES
T2	120Ω Tap at 8.5Ω		360337-1				Hor. Syncroguide Trans.
T3	144Ω	1240Ω	320030-1	A-8121	A-4000	TBO-2	Vert. Block Osc. Trans.
T4	360Ω Tap at 120Ω	SEC. 1 7Ω Tap at .6Ω SEC. 2 0Ω	320026-1	A-8117		TFB-1	Hor. Output Trans.
T5	640Ω	7.7Ω	320024-1	A-8115	A-3035	TSO-1	Vert. Output Trans.
T6A	14Ω		360330-1	DY-1			Hor. Deflection Coil
B	64Ω						Vert. Deflection Coil
T7	360Ω		360341-2				Focus Coil

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE PRI.	RATING IMPEDANCE SEC.	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA MAGNAVOX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T8	7KΩ	3.6Ω	420Ω	.5Ω	320027-2	A-3849	A-2902	RO-9 †	† Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS FIELD RES.	RATINGS V. C. IMP.	REPLACEMENT DATA MAGNAVOX PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	PM	3.6Ω		ST-117 MOD. P8-T	8A31	
	CONE DIA.	V. C. DIA.				
SP2	7 1/4"	1"				

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∽)	REPLACEMENT DATA MAGNAVOX PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
L1	.260A	27Ω	1.2 Henries	360340-1	C-2325 †	C-2991	TR-3300 †	† Drill one new mounting hole.

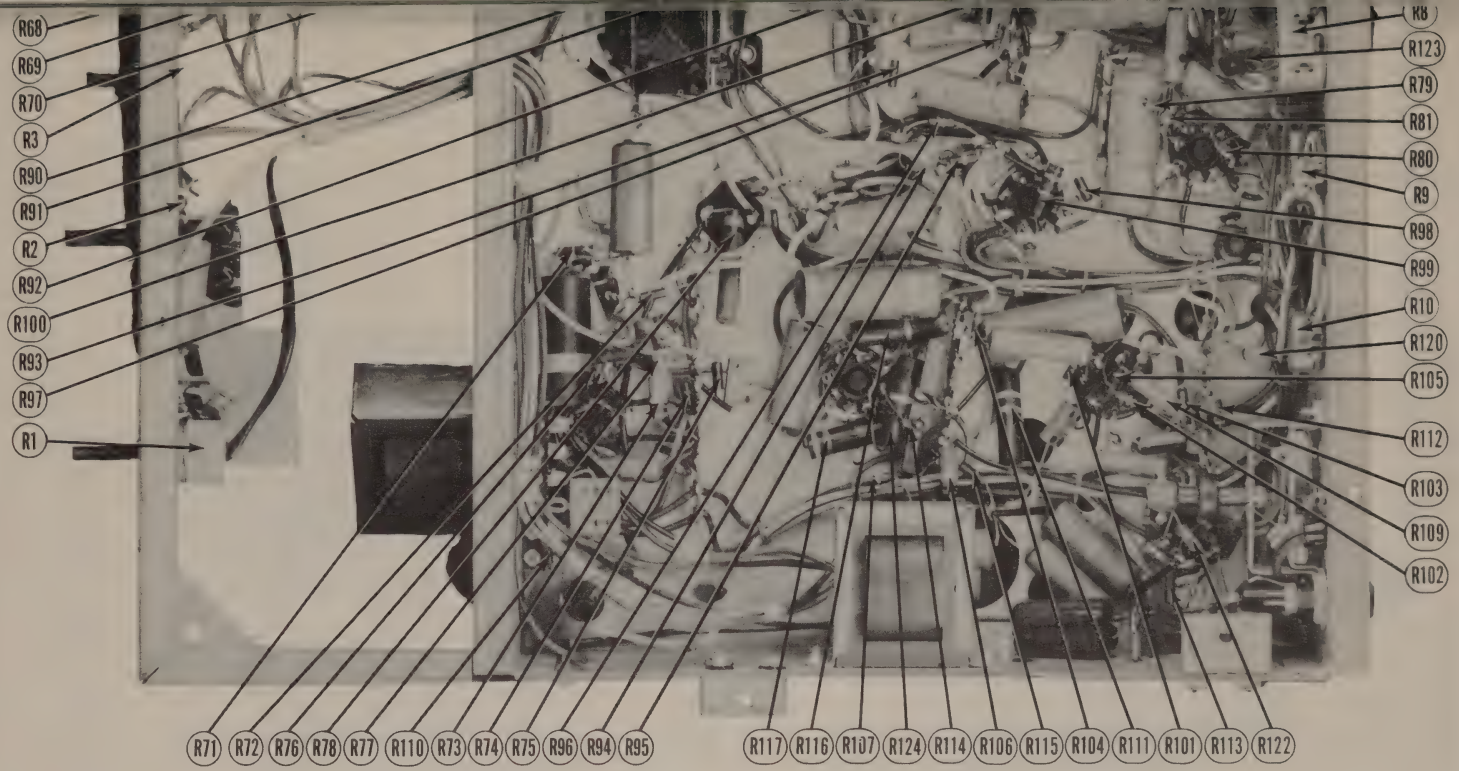
COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA MAGNAVOX PART No.	REPLACEMENT DATA MEISSNER PART No.	NOTES
L2	Ant. Input	0Ω				Wound on powdered iron core.
L3	Ant. Input High-Band	0Ω				
L4	Ant. Input High-Band	0Ω				
L5	Fil. Choke	0Ω				
L6	1st Video IF and Sound Trap	0Ω	0Ω			
L7	2nd Video IF	.1Ω	0Ω	360332-3		
L8	3rd Video IF	.1Ω	.1Ω	360332-5		
L9	Fil. Choke	0Ω		360332-11		
L10	Fil. Choke	0Ω		360332-11		
L11	4th Video IF	.1Ω		360332-6		
L12	Sound Trap	.1Ω		360332-4		
L13	5th Video IF	.1Ω		360332-6		
L14	Peaking	11Ω				Violet identification dot, (See Note)
L15	Peaking	2.5Ω		360332-14		Black identification dot.
L16	Peaking	6Ω		360332-8		Red identification dot.
L17	Peaking	6Ω		360332-9		White identification dot. Wound on 39KΩ resistor.
L18	Peaking	11Ω		360332-10		Green identification dot.
L19	1st Sound IF	.1Ω	.1Ω	360332-12		
L20	2nd Sound IF	.1Ω	.1Ω	360332-12		
L21	Disc. Trans.	.1Ω	.1Ω	360332-13		
L22	Hor. Linearity	35Ω		360334-1		
L23	Hor. Speed Coil	42Ω		360346-1		

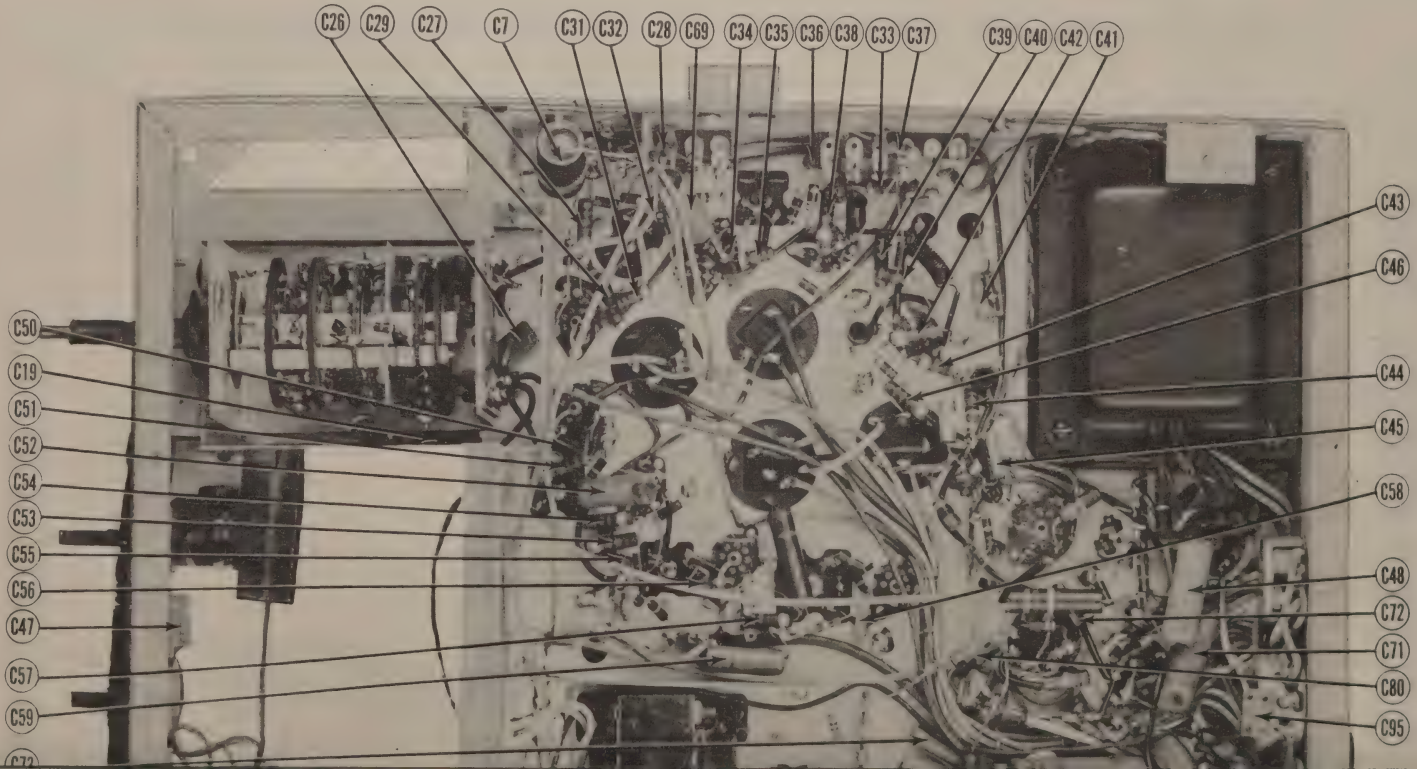
Note: Sets with suffix "A" or "B" have a peaking coil with a black identification dot (Part No. 360332-14).

MISCELLANEOUS

ITEM No.	PART NAME	MAGNAVOX PART No.	NOTES
M1A	RF Tuner	700320-1	Chassis CT220 only
B	RF Tuner	700317-1	Chassis CT219 only
C	RF Tuner	700318-1	Chassis CT222 only
M2	Switch	160192-1	Inter-lock
M3	Fuse	180157-15	.25A, 250V
M4	Fuse	180157-9	5A 250V
M5	Ion Trap		Permanent magnet type
M6	Crystal		Video detector. Sylvania 1N34
	Trimmer	260101-2	2 Gang. (Horiz. Lock and Horiz. Drive)



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION


C26
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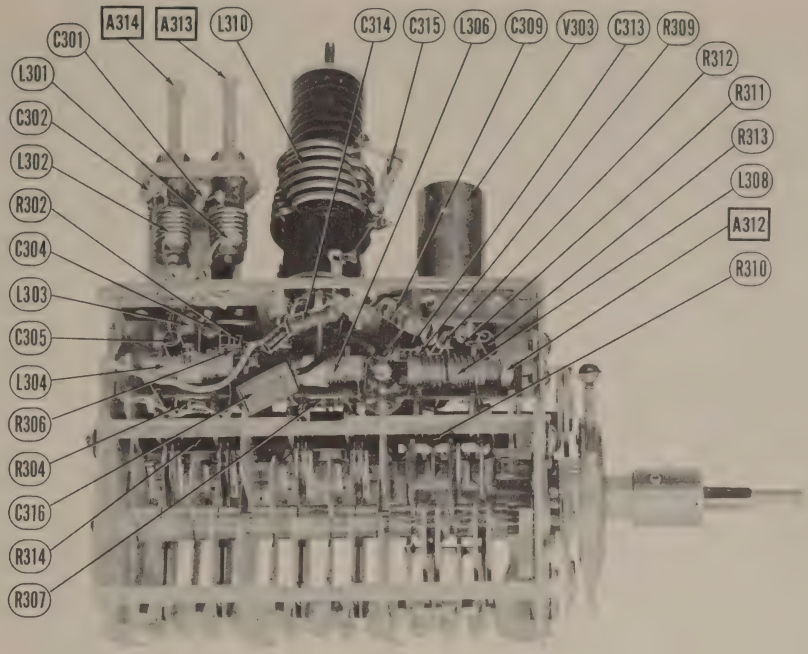
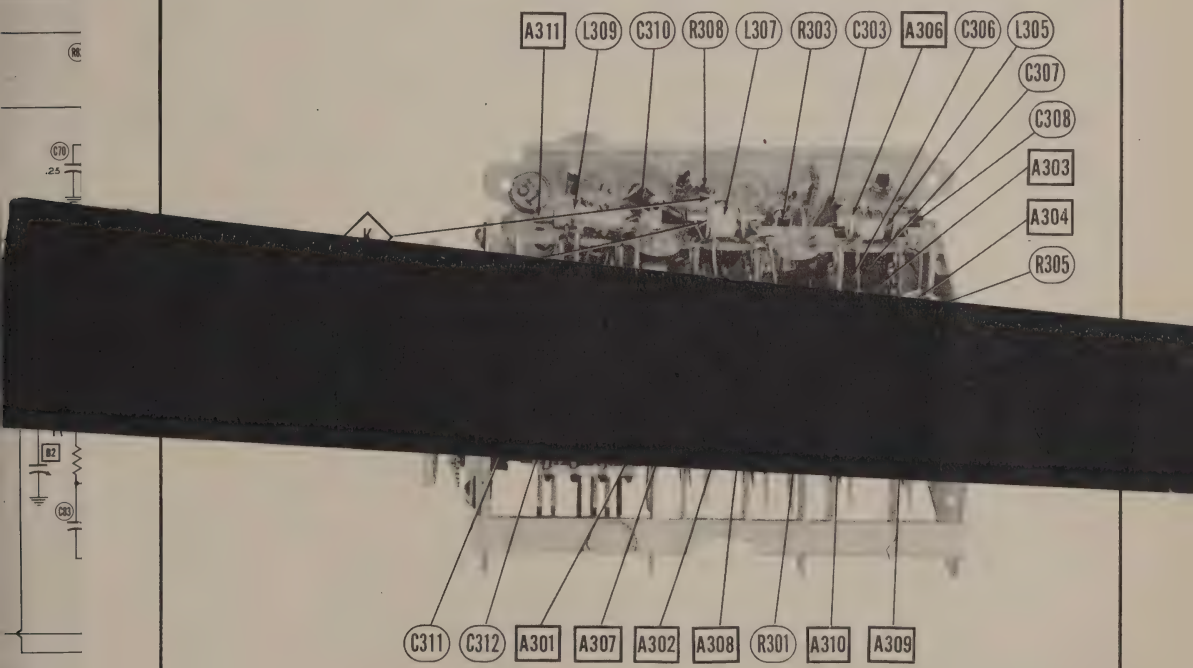
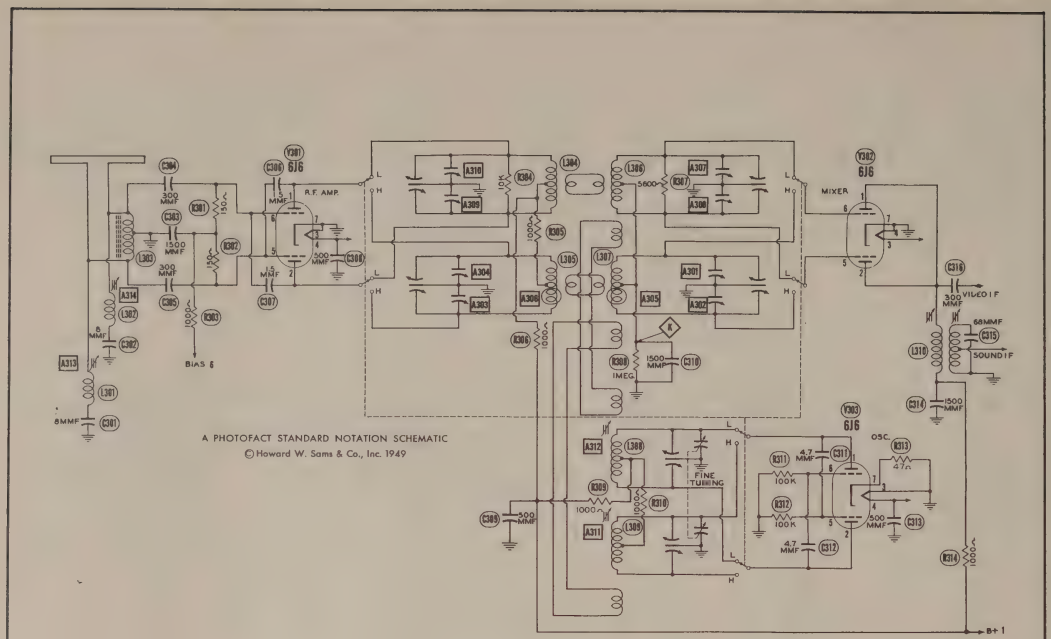


RF TUNER-LEFT SIDE



RF TUNER-RIGHT SIDE



RF TUNER

PARTS LIST AND DESCRIPTIONS

TUBES

ITEM No.	USE	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	
V301	RF Amp.			

RESISTORS

ITEM			
R307	5600Ω	½	RF Plate
R308	1 Meg	½	Mixer Coil Shunt
R309	1000Ω	½	Mixer Grid
R310	1000Ω	½	Osc. Plate
R311	100KΩ	½	Osc. Plate
R312	100KΩ	½	Osc. Grid
R313	47Ω	½	Osc. Grid
R314	1000Ω	½	Osc. Cathode
			Mixer Decoup.

CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT	IDENTIFICATION
C301	8		Fixed Trimmer
C302	8		Fixed Trimmer
C303	1500		Bias Filter
C304	300		RF Coupling
C305	300		RF Coupling
C306	1.5		Neutralizing
C307	1.5		Neutralizing
C308	500		Filament Bypass
C309	500		RF Bypass
C310	1500		Mixer Grid Filter
C311	4.7		Osc. Feedback
C312	4.7		Osc. Feedback
C313	500		Filament Bypass
C314	1500		Mixer Decoupling
C315	68		Fixed Trimmer
C316	300		IF Coupling

COILS

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	
L301	Interference Trap	0Ω		
L302	Interference Trap	0Ω		
L303	Ant. Input	0Ω		
L304	RF Low Band	0Ω		
L305	RF High Band	0Ω		
L306	Mixer Low Band	0Ω		
L307	Mixer High Band	0Ω		
L308	Osc. Low Band	0Ω		
L309	Osc. High Band	0Ω		
L310	IF Trans.	.2Ω	0Ω	

MOTOROLA MODEL CT9

TRADE NAME	Motorola, Model CT9
MANUFACTURER	Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Illinois
TYPE SET	Battery Operated Custom Built Automotive Superheterodyne Receiver.
TUBES (SIX)	Types 6BA6 RF Amp., 6BE6 Converter, 6BA6 IF Amp., 6AT6 DET-AVC-AF, 6V6GT Power Output, 6X4 Rectifier
POWER SUPPLY	6 Volt Storage Battery
TUNING RANGE—BROADCAST	535-1600KC
RATING	6.8 Amp. at 6 Volts DC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

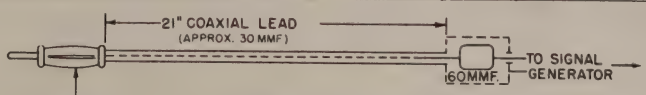
To set dial pointer turn the tuning gang slugs fully out (high frequency end) and adjust the pointer to 1500KC, while feeding a 1300KC signal into the antenna thru the dummy shown in figure 1.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

Adjust the signal generator to maintain, 1.79 volts (one watt) reading on the output meter.

The antenna trimmer (A7) is reached from the front after removing the top pushbutton.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (Grid) of 6BE6 (V2). Low side to chassis.	455KC (400 ~ Mod.)	High frequency end. (tuning cores fully out)	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	Special (See Fig 1)	High side thru dummy to ant. terminal. Low side to chassis.	1605KC	"	"	A5, A6 A7	Pre-set the tuning cores A8, A9, and A10 so the screw projects 5/16" from the core adjustment clips. Adjust A5, A6 and A7 in that order for maximum output.
3.	"	"	1425KC	Using manual knob set tuner to extreme high frequency end. Then turn knob until carriage moves inward 3/16".	"	A8, A9, A10	Adjust A8, A9, A10 in that order for maximum output.
4.	"	"	Turn gen. off.	Move carriage 1 1/32" inward from fully out. (See step above)	Disconnect output meter.	A11	Adjust A11 for maximum noise. If A11 must be moved over 1/2 turn, repeat steps 2, 3, 4, until less than 1/2 turn of A11 is required.
5.				Approx. 1400KC		A7	Install set in car and tune in a weak station near 1400KC. Adjust A7 for maximum signal. If no station is available, peak background noise.



DUMMY ANTENNA

FIG. 1

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1950 by Howard W. Sams & Co., Inc., Indianapolis Indiana, U. S. of America. Copyright under International Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	RF Amp.	6BA6	6BA6	7BK	
V2	Converter	6BE6	6BE6	7CH	
V3	IF Amp.	6BA6	6BA6	7BK	
V4	DET.-AVC-AF	6AT6	6AT6	7BT	
V5	Power Output	6V6GT	6V6GT	7AC	
V6	Rectifier	6X4	6X4	5BS	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	30	350	23A473015	AFH64H4A	UP335-		EL-323	■ Filter
B	30	300			330C			▲ Filter
C	20	25						Output Cathode Bypass
C2	100		21B77562	1469-0001	5R5T1	GP1K-100	MS-31	Fixed Trimmer
C3	.006	100	8C4529	P285-006	GT6D6	GP2M-0056	68P12	RF Coupling
C4	.05	100	8K13514	P285-05	ZYW1S5		68P16	AVC Filter
C5	.05	400	8K14791	P488-05	GT4S5		TM-15	Decoupling
C6	5		21K70720	1468-000005	5W5V5	NPOK-5	MS-55	RF Coupling
C7	50	300	21R6513	1468-00005	5W5Q5	GP1K-50	1FM-45	Osc. Grid Cap.
C8	400		21A71872					Fixed Trimmer
C9	.05	100	8K13514	P285-05	ZYW1S5		68P16	Conv. Cath. Bypass
C10	50	300	21K74661	1468-00005	5W5Q5		1FM-45	IF Coupling
C11	.05	100	8K13514	P285-05	ZYW1S5		68P16	Audio Coupling
C12	.01	100	8R472754	P285-01	ZZW1S1	821-01	68P14	Tone Compensation
C13	.006	100	8C4529	P285-006	GT6D6	GP2M-0056	68P16	Tone Compensation
C14	.03	400	8K71911	P488-03	GT4S3		TM-13	Audio Coupling
C15	500		21K481377	1468-0005	5W5T5	GP2K-500	1FM-35	Output Grid Bypass
C16	.006	400	8K71910	P688-006	GT6D6	GP2M-0056	TM-26	Output Plate Bypass
C17	.006	1600	8K12840	P1688-006	GT16D6		MB-26	Buffer
C18	.5	100	8K17028	P288-5	GT2P5		68P20	Hash Filter
C19	.5	100	8K17028	P288-5	GT2P5		68P20	Hash Filter

CONTROLS

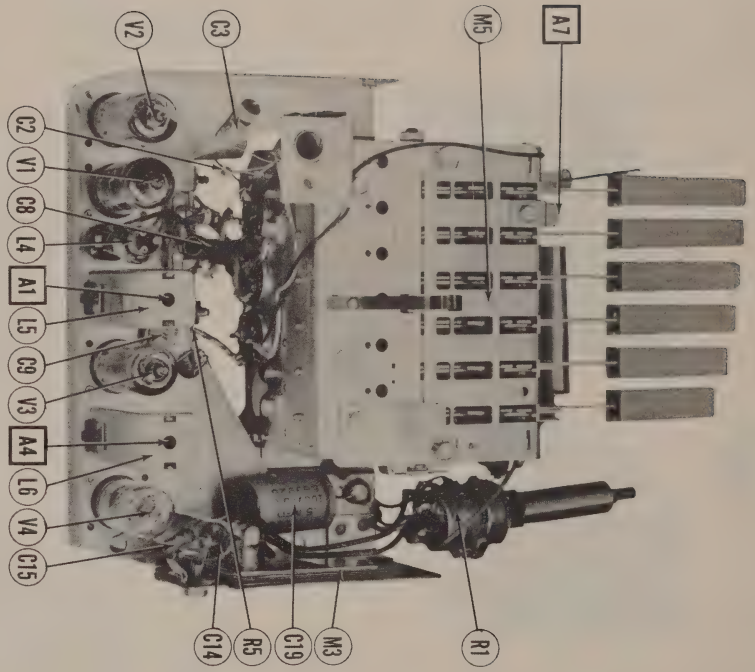
ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1A	500KΩ			B11-133 *		Tone control -Panel
B	500KΩ			B18-133X *		Volume control -Rear Tapped at 50KΩ
C	Shaft End		18B590604	E187 *		Attach per instructions in "Concentrikit"
D	Sleeve Bushing			S-5 # *		Attach to "Concentrikit" bushing.
E	Switch			76-1 *		Attach per instructions in "Concentrikit".

* Additional parts to be used with "Concentrikit".
\# Cut off S-5 bushing to duplicate original bushing length.

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R2	470KΩ	½	6R6032	BTS-470K	RF Grid
R3	330Ω	½	6R6010	BW-½-330	RF Cathode
R4	100KΩ	½	6R6075	BTS-100K	Conv. Grid
R5	330Ω	½	6R6010	BW-½-330	Conv. Cathode
R6	47KΩ	½	6R6056	BTS-47K	Osc. Grid
R7	1 Meg.	½	6R6004	BTS-1 Meg.	AVC Network
R8	330Ω	½	6R6010	BW-½-330	IF Cathode
R9	6800Ω	1	6R6287	BTA-6800	Decoupling
R10	68KΩ	½	6R6001	BTS-68K	Voltage Divider
R11	22KΩ	½	6R6028	BTS-22K	Tone Compensation
R12	47KΩ	½	6R6056	BTS-47K	Diode Filter
R13	1 Meg.	½	6R6004	BTS-1 Meg.	Diode Load
R14	1500Ω	½	6R6161	BTS-1500	AF Cathode
R15	3.3 Meg.	½	6R2118	BTS-3.3 Meg.	AF Grid
R16	470KΩ	½	6R6032	BTS-470K	AF Plate
R17	220KΩ	½	6R6015	BTS-220K	Output Grid

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

R18	270Ω	1	6R8336	BW-1-270	Output Cathode
R19	1000Ω	1	6R6184	BW-1-1000	Filter
R20	10KΩ	1	6R6054	BTS-10K	Bailer
R21	100Ω	1	6R6415	BW-1-100	Hash Suppression

TRANSFORMER (VIBRATOR)

ITEM No.	RATING				REPLACEMENT DATA			
					MOTOROLA	STANCOR	MERIT	CHICAGO
	PRI.	SEC. 1	SEC. 2	SEC. 3	PART No.	PART No.	PART No.	PART No.
T1	6VDC at 4.4A	280VC·T .058ADC			25K590650	P-4081 †	P-2971 †	VT-2 †

† Drill new mounting holes.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		MOTOROLA	STANCOR	MERIT	CHICAGO	
	PRI.	SEC.	PRI.	SEC.	PART No.	PART No.	PART No.	PART No.	
T2	5.4KΩ	3.5Ω	335Ω	.3Ω	25B590648	A-3877	A-2930	RO-301	

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			MOTOROLA PART No.	JENSEN PART No.	QUAM PART No.	
	FIELD	V. C. IMP.		ST-108		
SP1	PM	3.5Ω	50K590681	MOD-P6-X	6A1	
	CONE DIA.	V. C. DIA.				
SP2	5 1/8"	3/4"				

R F COILS

ITEM No.	USE	DC RES.		REPLACEMENT DATA		
				MOTOROLA	MEISSNER	
		PRI.	SEC.	PART No.	PART No.	
L1	Ant. Coil	1Ω		24B71881		Part of tuner AT-71. Specify color of paint dot on old coil when ordering.
L2	RF Coil	1Ω		24B71881		
L3	Osc. Coil	2.8Ω		24B71879		
L4	Osc. Padder	6Ω		24A70227		
L5	Input IF	17Ω	17Ω	24B485553	16-6668	Less shield.
L6	Output IF	17Ω	17Ω	24K485555		Less shield.
L7	Hash Choke	.2Ω		24A472525		

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA			INSTALLATION NOTES
				MOTOROLA PART No.	CORNELL-DUBILIER PART No.	RADIART PART No.	
M1	Int.	6V	115 ~	46B3333	C42M	5342	

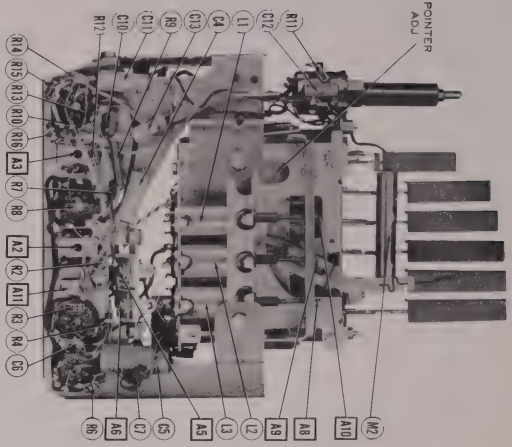
DIAL LIGHTS

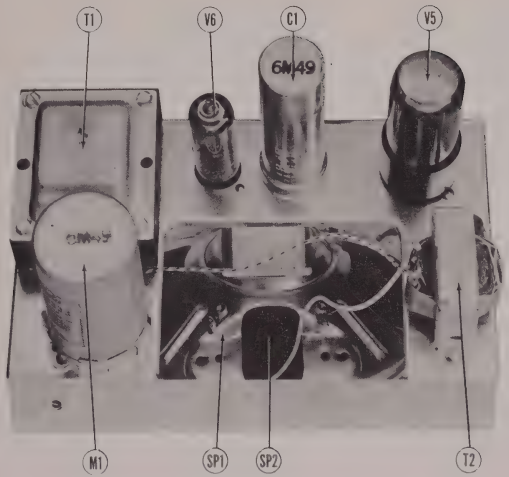
ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA		NOTES
					MOTOROLA PART No.		
M2	Bayonet	6-8	.25	Blue	65X10867		Type #44

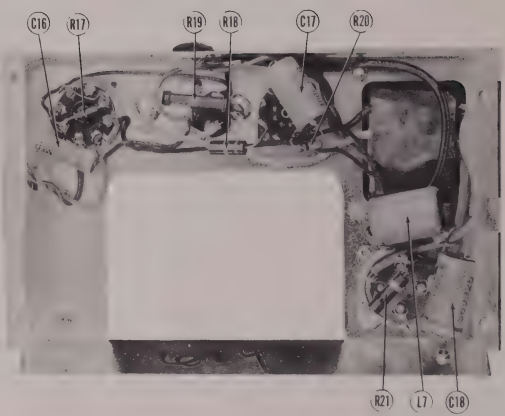
MISCELLANEOUS

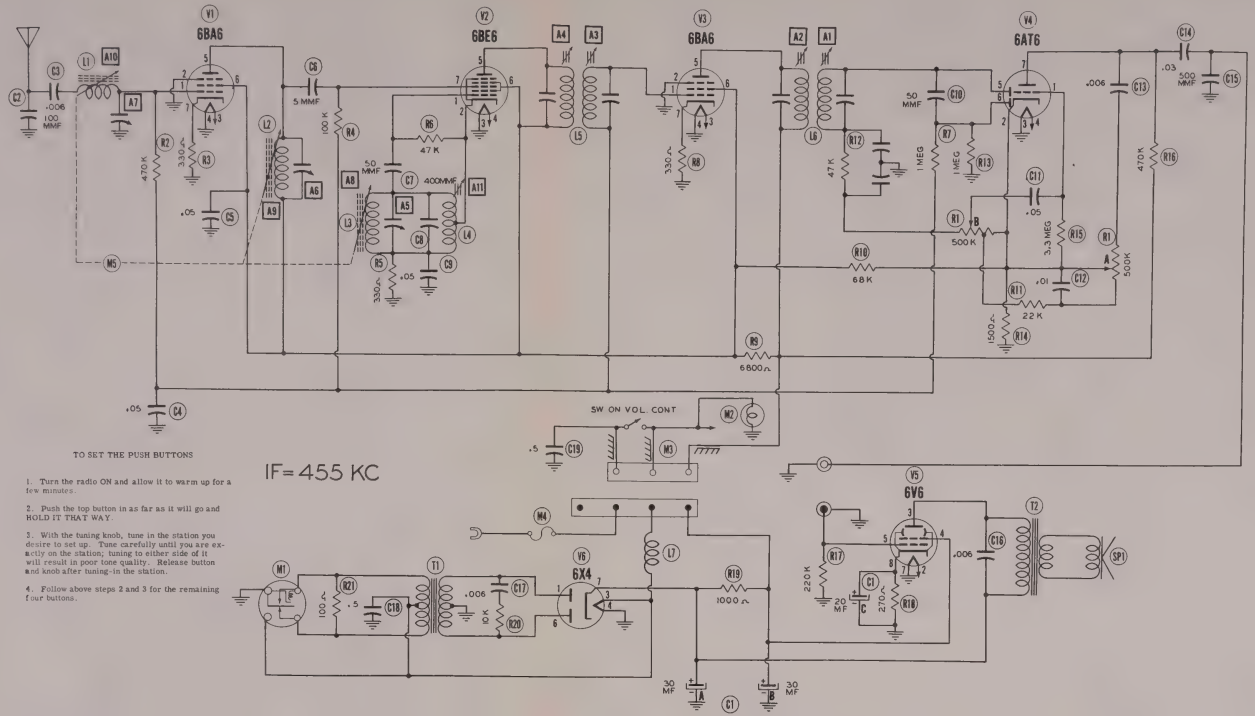
ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M3	Spark Plate	1A590637	
M4	Fuse	65A10266	10 Amp. 3AG
M5	Tuner	1X590784	
A5	Dual Trimmer	20A590639	Osc. Adj.
A6			RF Adj.
A7	Trimmer	30A590639	Ant. Adj.
	Dial Scale	34C590802	

CHASSIS—BOTTOM VIEW









TO SET THE PUSH BUTTONS

1. Turn the radio ON and allow it to warm up for a few minutes.
2. Push the top button in as far as it will go and HOLD IT THAT WAY.
3. With the tuning knob, tune in the station you desire to set up. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality. Release button and knob after tuning-in the station.
4. Follow above steps 2 and 3 for the remaining four buttons.

IF = 455 KC

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6BA6	0V.	0V.	6VDC	0V.	85VDC	85VDC	2VDC	
V 2	6BE6	3VDC	‡2.6VDC	0V.	6VDC	85VDC	85VDC	0V.	
V 3	6BA6	0V.	0V.	6VDC	0V.	185VDC	85VDC	2VDC	
V 4	6AT6	.1VDC	2.2VDC	0V.	6VDC	.2VDC	0V.	55VDC	
V 5	6V6GT	0V.	6VDC	200VDC	185VDC	0V.	200VDC	0V.	6.5VDC
V 6	6X4	230VAC		260VAC	6VDC	0V.	0V.	230VAC	

‡TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6BA6	2.5 Meg.	0Ω	.1Ω	0Ω	†7KΩ	†7KΩ	330Ω	
V 2	6BE6	47KΩ	330Ω	0Ω	.1Ω	†7KΩ	†7KΩ	2.1 Meg.	
V 3	6BA6	2 Meg.	0Ω	.1Ω	0Ω	†1000Ω	†7KΩ	330Ω	
V 4	6AT6	3.3 Meg.	1.5KΩ	0Ω	.1Ω	600KΩ	1 Meg.	†470KΩ	
V 5	6V6GT	0Ω	.1Ω	†330Ω	†1000Ω	220KΩ	†0Ω	0Ω	270Ω
V 6	6X4	46Ω		10KΩ	.1Ω	0Ω	Inf.	36Ω	60KΩ

† Measured from pin 7 of V6.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 6 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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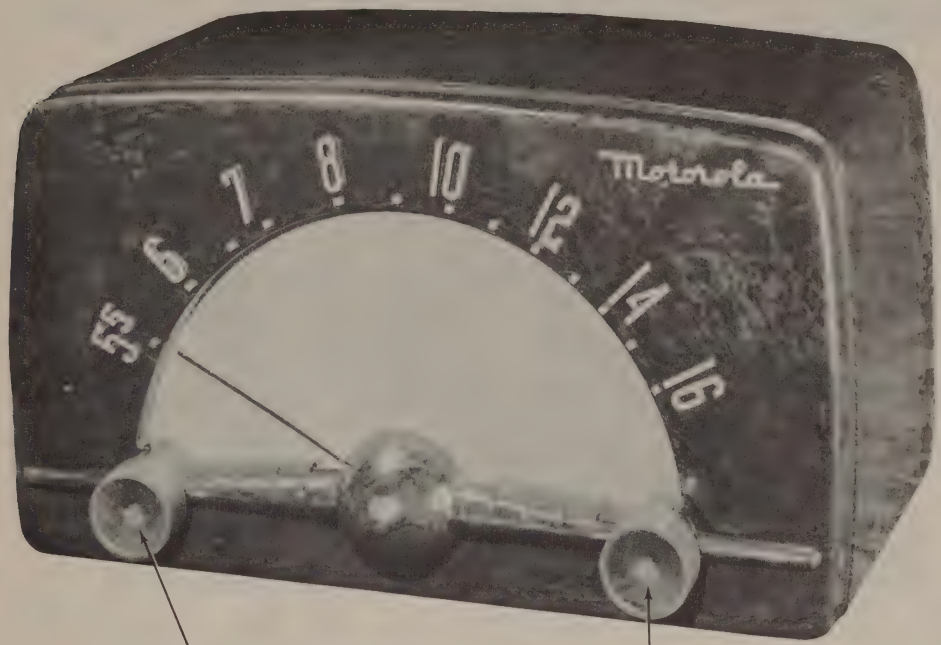
MOTOROLA MODELS
69X11, 69X121 (Ch. HS-181)



MOTOROLA MODELS
69X11, 69X121 (Ch. HS-181)

MOTOROLA MODEL 69X11

TRADE NAME	Motorola, Models 69X11, 69X121 (Ch. HS-181)
MANUFACTURER	Motorola Inc., 4545 Augusta Blvd., Chicago 51, Illinois
TYPE SET	AC-DC Operated Superheterodyne Receiver with Loop Antenna
TUBES (SIX)	Types 12BA6 RF Amp., 12BE6 Converter, 12BA6 IF Amp., 12AT6 DET-AVC-AF, 35C5 Power Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-DC RATING .25 Amp. at 117 Volts AC
TUNING RANGE—BROADCAST	535-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer turn tuning cap. fully closed and set pointer to last reference mark at low frequency end of dial.

Use isolation transformer if available. If not, connect a .1MFD capacitor in series with low side of signal generator and chassis.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to rear stator of tuning gang. Low side to chassis.	455KC (400 ~ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	.1MFD	"	"	"	"	A5	Adjust for MINIMUM output.
3.	.1MFD	"	1620KC (400 ~ Mod.)	"	"	A6	Adjust for maximum output.
4.		Loop	1400KC (400 ~ Mod.)	Tune for max. signal.	"	A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

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PARTS LIST AND DESCRIPTIONS

MOTOROLA MODEL 69X11

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	RF Amp.	12BA6	12BA6	7BK	
V2	Converter	12BE6	12BE6	7CH	
V3	IF Amp.	12BA6	12BA6	7BK	
V4	DET.-AVC-AF	12AT6	12AT6	7BT	
V5	Power Output	35C5	35C5	7CV	
V6	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	150	23K484234	PRSA844D	EDI42215		TA-304	Filter Red
B	20	150						Filter Blue
C	20	150						Filter Orange
C2	.05	200	8S9821	P288-05	GT2S5		TM-15	AVC Filter
C3	100	500	21P6641	1468-0001	5W5T1	GPIK-100	1FM-31	RF Coupling
C4	.05	200	8S9821	P288-05	GT2S5		TM-15	AVC Filter
C5 A	220			1468-00025	5W5T25	GP2K-220		Diode RF Filter
B	2000		21B482847	P688-002	GT6D2	GP2M-002	34C3	Audio Coupling
C	220			1468-00025	5W5T25	GP2K-220		AF Plate Bypass
D	5000			P688-005	GT6D5	GP2M-005		Audio Coupling
C6	5000		*	P688-005	GT6D5	GP2M-005	TM-25	Tone Compensation
C7	.02	400	8S9802	P488-02	GT4S2		TM-12	Output Plate Bypass
C8	.05	400	8S9816	P488-05	GT4S5		TM-15	Line Filter

* Items C6 and R9 are combined into one unit, obtainable under MFGR'S Part No. 21B484227.

CONTROLS

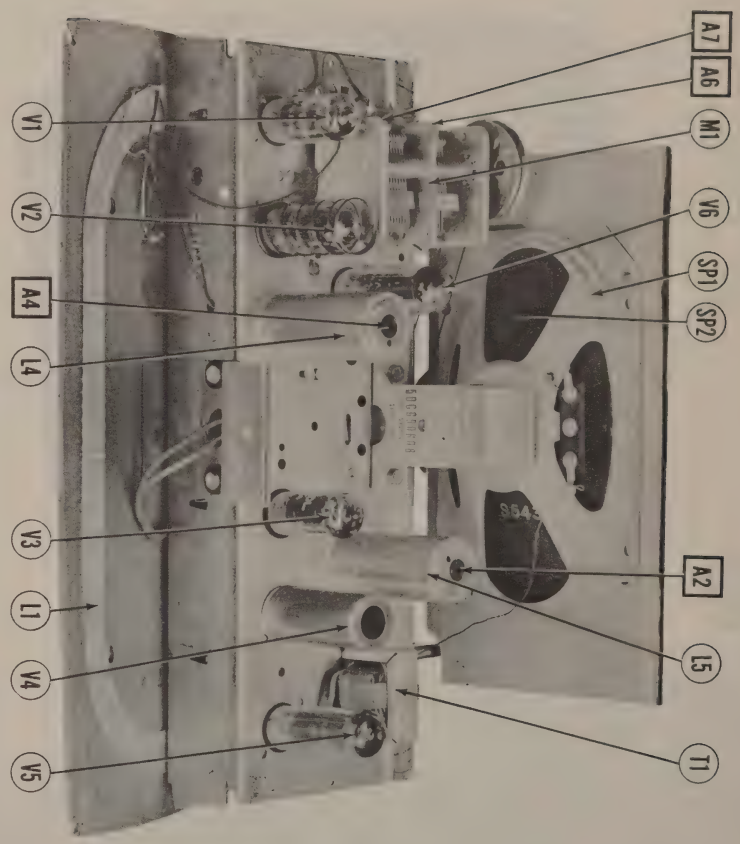
ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	18K485925	Q13-137X		Volume control tapped at 300KΩ.
B	Switch		Not Req.	76-1		Attach to R1A per instructions

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R2	100KΩ	½	6R6075	BTS-100K	AVC Network
R3	100Ω	½	6R6018	BW-½-100	RF Cathode
R4	4700Ω	½	6R6039	BTS-4700	RF Plate
R5	22KΩ	½	6R6028	BTS-22K	Conv. Grid
R6	22KΩ	½	6R6028	BTS-22K	Osc. Grid
R7	100Ω	½	6R6018	BW-½-100	IF Cathode
R8	3.3 Meg.	½	6R2118	BTS-3.3 Meg.	AVC Network
R9	33KΩ	½	*	BTS-33K	Tone Compensation
R10	10 Meg.	½	6R2109	BTS-10 Meg.	AF Grid
R11	470KΩ	½	6R6032	BTS-470K	AF Plate
R12	470KΩ	½	6R6032	BTS-470K	Output Grid
R13	150Ω	½	6R3992	BW-½-150	Output Cathode
R14	1000Ω	1	6R3953	BW-1-1000	Filter
R15	100Ω	1	6R488025	BW-1-100	Filter
R16	27Ω	½	6R5683		Surge Limiter

* Items C6 and R9 are combined into one unit, obtainable under MFGR'S Part No. 21B484227.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		MOTOROLA PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	2300Ω	3.5Ω	235Ω	.4Ω	25B482858	A-3332	A-3025	RO-2 †	† Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			MOTOROLA PART No.	JENSEN PART No.	QUAM PART No.	
	FIELD	V. C. IMP.				
SP1	PM	3.5Ω	50C690608		46A1	
	CONE DIA.	V. C. DIA.				
SP2	3 7/8" x 5 7/8"	9/16"				

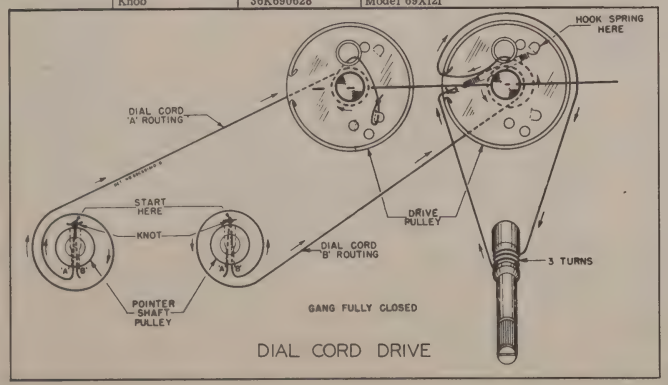
R F COILS

ITEM No.	USE	DC RES.		REPLACEMENT DATA		
		PRI.	SEC.	MOTOROLA PART No.	MEISSNER PART No.	
L1	Loop Ant.	3.2Ω		24C690621		Includes Panel
L2	Wave Trap	63Ω		24A77336		
L3	Osc. Coil	13Ω		24K482855	14-1060 *	Alternate part #24A680364.
L4	Input IF	12Ω	12Ω	24B482863	16-6678	Less Shield
L5	Output IF	12Ω	12Ω	24B482865	16-6678	Less Shield

* Add 50MMF from Osc. Grid to high side of tuning cap.

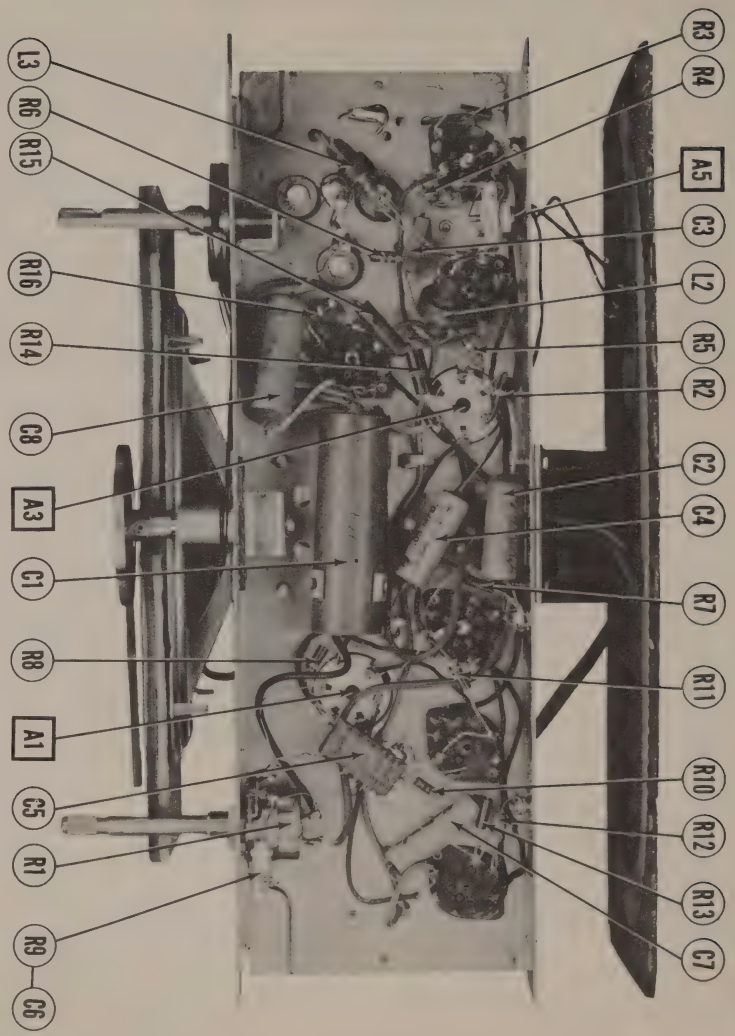
MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M1	2 Gang. Var. Cap.	1X690702	(21-397MMF, 13-105MMF)
A5	Trimmer	20A28941	Wave Trap Adj.
	Dial Pointer	52B690742	
	Cabinet	16E690510	Model 69X11
	Cabinet	16K690686	Model 69X12I
	Knob	36K690627	Model 69X11
	Knob	36K690628	Model 69X12I



DIAL CORD DRIVE

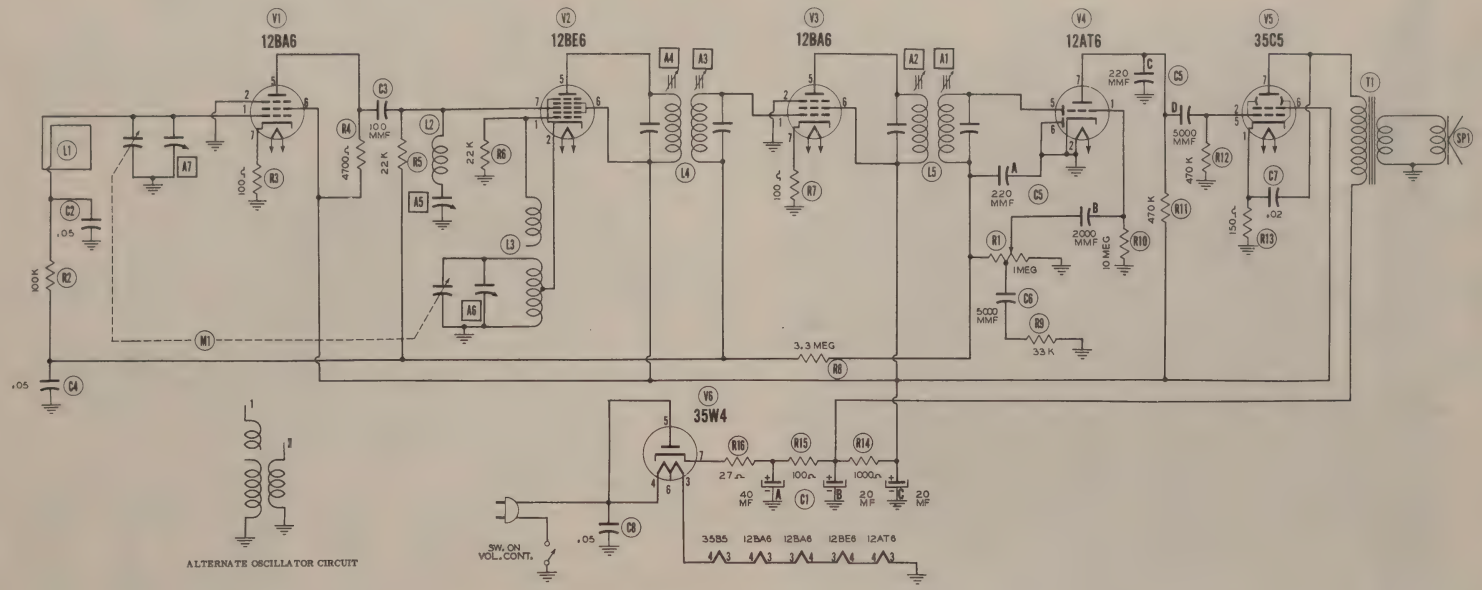
CHASSIS—BOTTOM VIEW



SET 82 FOLDER 9

MOTOROLA MODEL 69X11

MOTOROLA MODEL 69X11



ALTERNATE OSCILLATOR CIRCUIT

IF = 455 KC

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BA6	-.1VDC	0V.	36VAC	24VAC	55VDC	87VDC	1VDC
V 2	12BE6	§-5.8VDC	0V.	24VAC	12VAC	87VDC	87VDC	-.1VDC
V 3	12BA6	-.1VDC	0V.	36VAC	48VAC	87VDC	87VDC	.8VDC
V 4	12AT6	-.9VDC	0V.	0V.	12VAC	-.4VDC	0V.	40VDC
V 5	35C5	5.3VDC	0V.	48VAC	85VAC	0V.	87VDC	115VDC
V 6	35W4	125VDC	122VDC	95VAC	117VAC	117VAC	110VAC	130VDC

§TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BA6	4.3 Meg.	0Ω	36Ω	24Ω	†6KΩ	†1000Ω	100Ω
V 2	12BE6	22KΩ	1Ω	24Ω	12Ω	†1000Ω	†1000Ω	4.3 Meg.
V 3	12BA6	4.3 Meg.	0Ω	36Ω	48Ω	†1000Ω	†1000Ω	100Ω
V 4	12AT6	10 Meg.	0Ω	0Ω	12Ω	1 Meg.	0Ω	†470KΩ
V 5	35C5	1SΩ	470KΩ	48Ω	80Ω	470KΩ	†1000Ω	†340Ω
V 6	35W4	60KΩ	60KΩ	80Ω	110Ω	110Ω	105Ω	55KΩ

† Measured from pin 7 of V6.

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

PHOTOFACT* Folder

*TRADE MARK

PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV, 2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV

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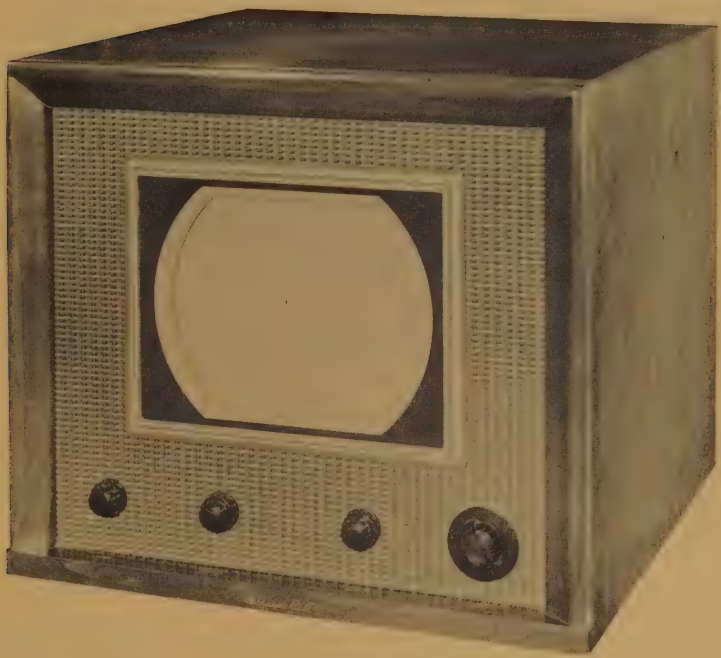

MODEL 2293-TV

PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV, 2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV

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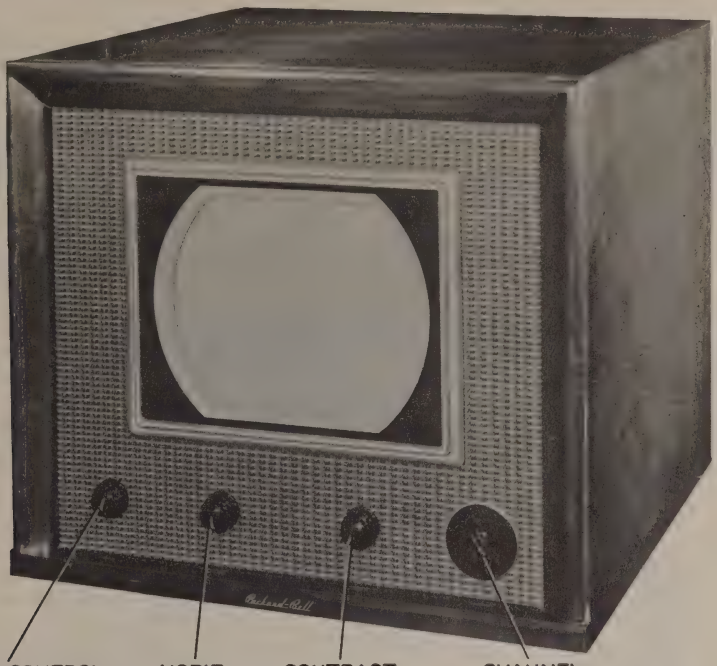

PACKARD - BELL MODEL 2293-TV

TRADE NAME	Packard-Bell Models 2291-TV, 2292-TV, 2293-TV, 2294-TV, 2295-TV, 2296-TV, 2297-TV Standard, 2297-TV Deluxe, 2298-TV.
MANUFACTURER	Packard-Bell Co., 3443 Wilshire Blvd., Los Angeles, Calif.
TYPE SET	Television Receiver
TUBES	Twenty Two
POWER SUPPLY	110-120 Volts AC - 60Cycle RATING 2Amp. at 117 Volts AC
TUNING RANGE	Channels 2 thru 13

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PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV, 2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV

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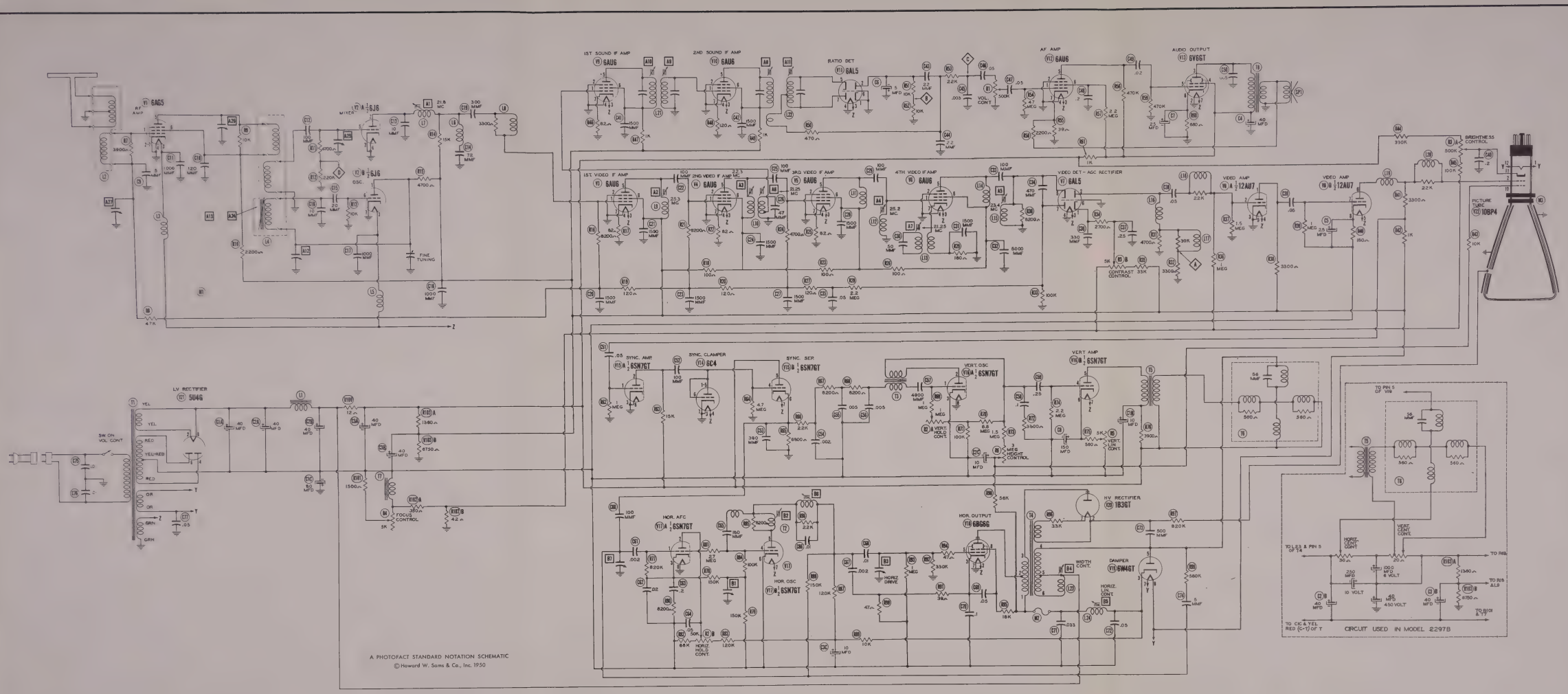
DATE 1–50 SET 82 FOLDER 10


A PHOTOFACT STANDARD NOTATION SCHEMATIC
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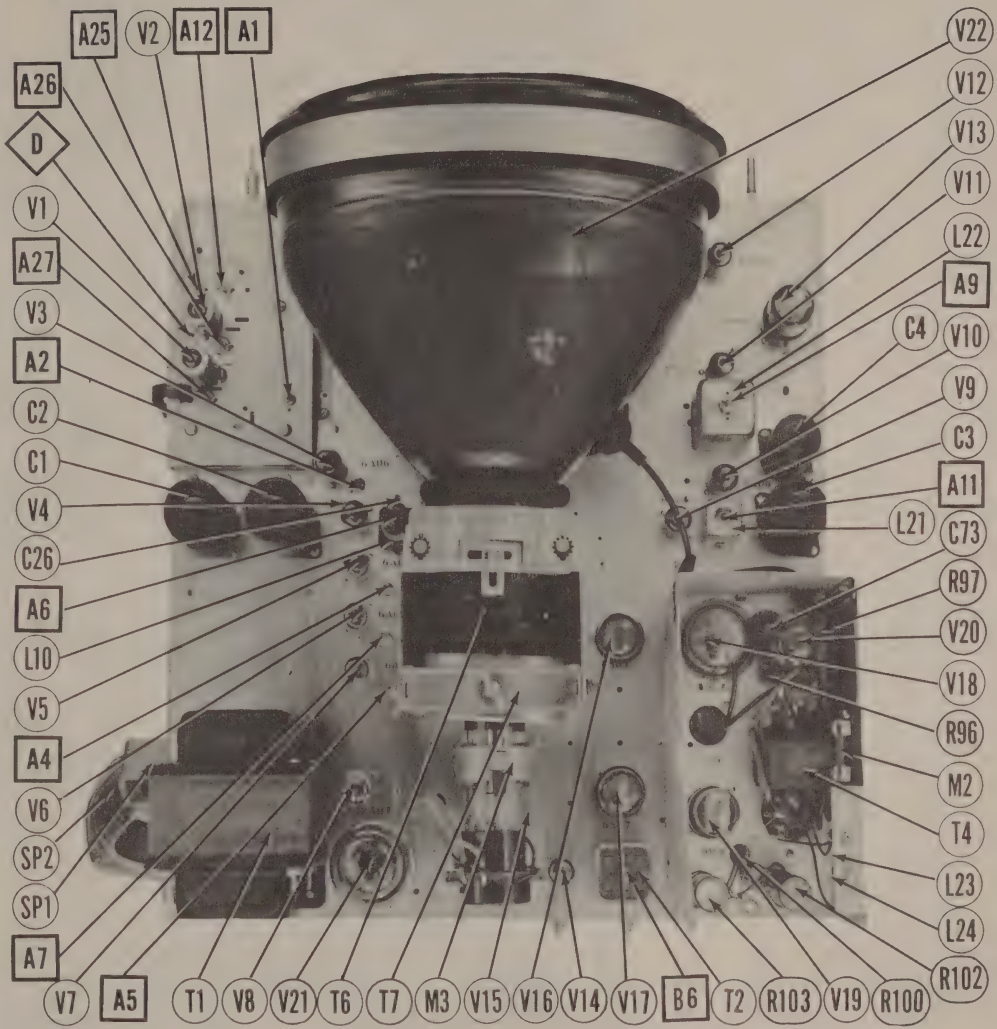
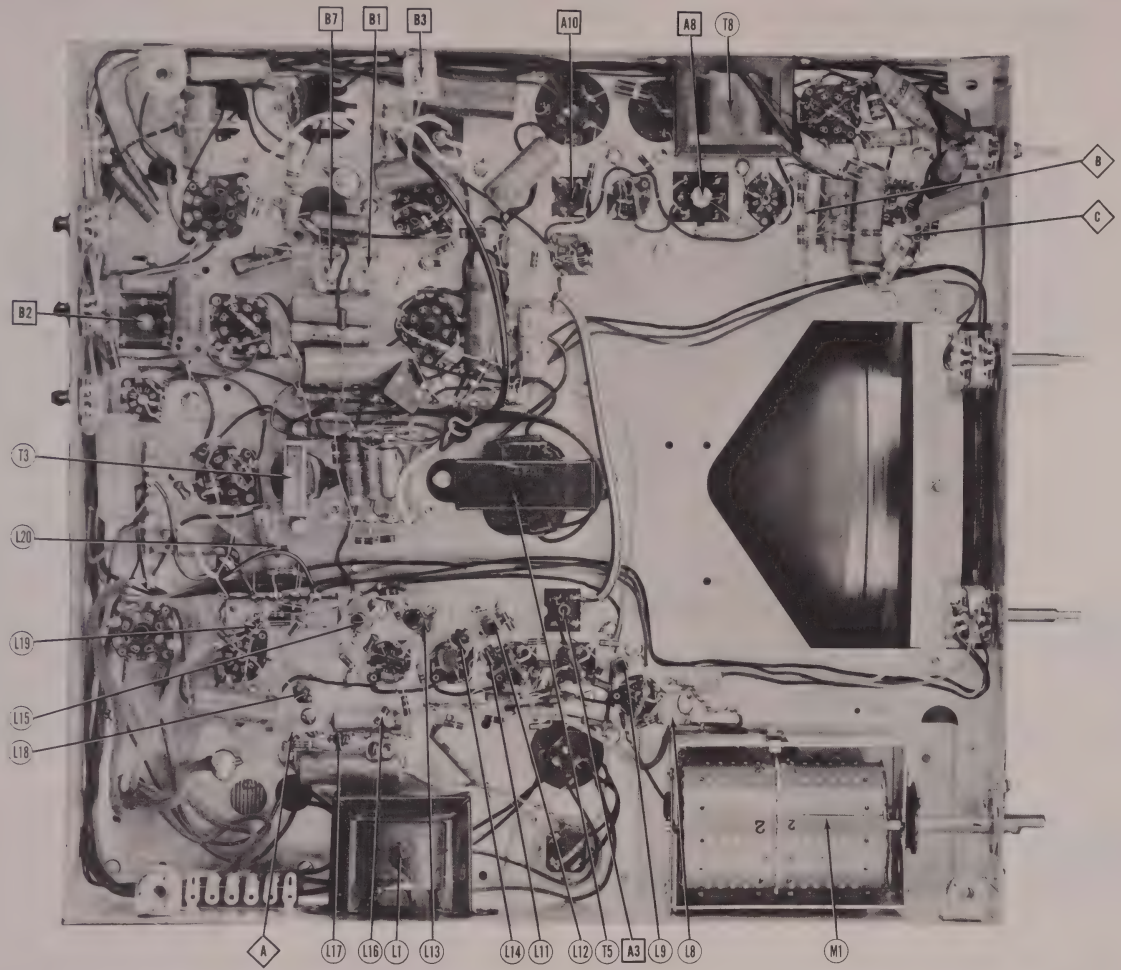
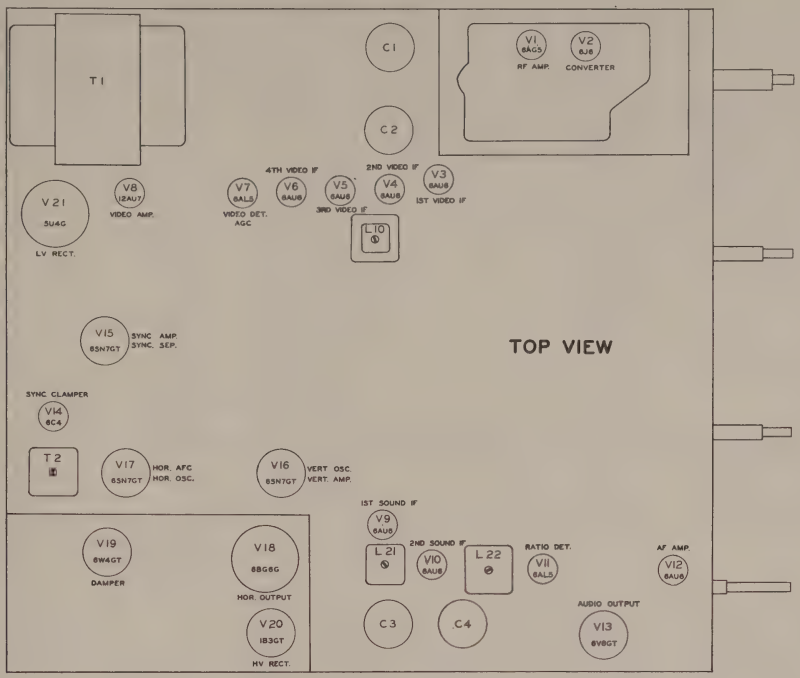
CIRCUIT USED IN MODEL 2297B

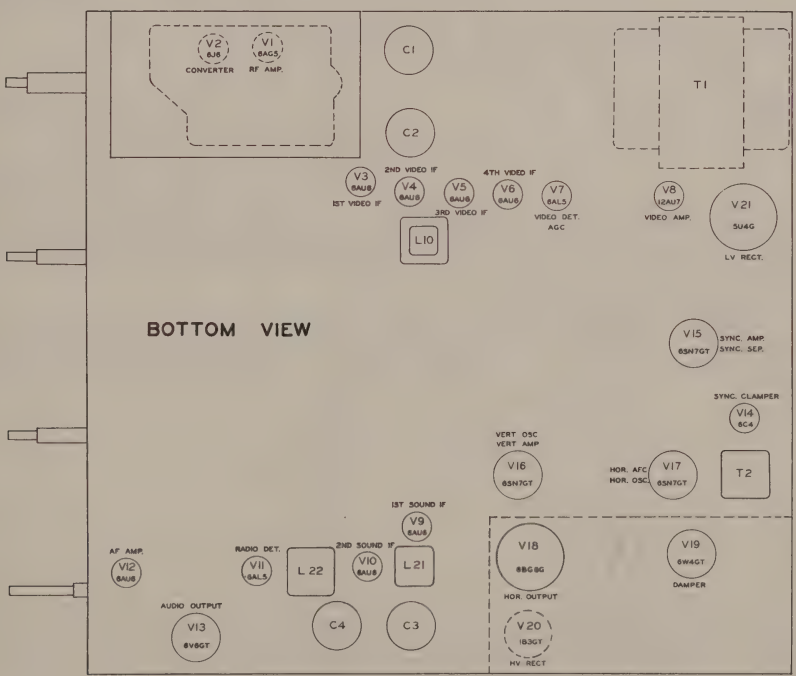


CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION





TUBE PLACEMENT CHART

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The alignment frequencies for models 2291, 2292, 2293, 2294 and 2295 are indicated by an asterisk (*). The alignment frequencies for models 2297 and 2298 are indicated by a dagger (†). Determine the model set to be aligned and use the frequencies for that set.

If the set is to be aligned with the picture tube removed, the high voltage power supply should be disabled by removing the horizontal oscillator tube (V17).

VIDEO IF ALIGNMENT

Remove the channel 13 segment of the oscillator section (front) of the tuner turret. Turn the channel selector switch to channel 13 during video IF alignment. This disables the local oscillator and removes the possibility of erroneous indications.

Turn the contrast control to maximum clockwise position.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	Across antenna terminals.	21.8MC * 20.5MC † (Unmod)	13 (See note above)	DC Probe to Point (A) Common to chassis	A1	Adjust for maximum deflection.
2.	Direct	"	25.3MC * 24.55MC †	"	"	A2	"
3.	Direct	"	22.8MC * 21.55MC †	"	"	A3	"
4.	Direct	"	25.2MC * 21.45MC †	"	"	A4	"
5.	Direct	"	23.4MC * 22.65MC †	"	"	A5	"
6.	Direct	"	21.25MC * 20.5MC †	"	"	A6, A7	Adjust for MINIMUM deflection.

OVERALL VIDEO IF RESPONSE CHECK

Set the contrast control to read 2.5 volts on VTVM connected across C35. If the set is to be operated in a "fringe" area, set this voltage to approximately 1 volt.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Direct	Across antenna terminals.	24MC (10MC Sweep)	21.25MC * 20.5MC † 22.3MC * 21.55MC † 25.75MC * 25.0MC †	13	Vert. Amp. to Point (A) Low side to chassis.		Check for response curve and marker placement as per Fig 1. If necessary slightly retouch A1 thru A5 for proper response and marker placement.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.01MFD	High side to pin 1 (Grid) of 6AU6 (V9). Low side to chassis.	21.25MC * 20.5MC † (Unmod.)	Any	DC Probe to Point (B) Common to chassis.	A8, A9, A10	Adjust for maximum deflection.
9.	.01MFD	"	"	"	DC Probe to Point (C) Common to Point (B)	A11	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60 ~ modulation and 450KC sweep. Use 120 ~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	.01MFD	High side to pin 1 (Grid) of 6AU6 (V9). Low side to chassis.	21.25MC (450KC Sweep)	21.25MC * 20.5MC †	13	Vert. Amp. to Point (B) Low side to chassis.	A8, A9, A10	Disconnect stabilizer capacitor C6. Adjust for maximum amplitude and symmetry as per Fig 2.
9.	.01MFD	"	"	"	"	Vert. Amp. to Point (C) Low side to chassis.	A11, A8	Reconnect capacitor C6. Adjust A11 so 21.25MC occurs at center of crossover lines as per Fig 3. SLIGHTLY retouch A8 for maximum amplitude and straightness of crossover lines.

OSCILLATOR ALIGNMENT

The overall oscillator circuit adjustment (A12) is pre-set at the factory and should not require further adjustment in the field.

The individual channel oscillator adjustments are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.

Replace the channel 13 segment of the tuner turret.

Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	215.75MC (Unmod.)	13	DC Probe to Point (C) Common to Point (B)	A13	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
			209.75MC	12		A14	
			203.75MC	11		A15	
			197.75MC	10		A16	
			191.75MC	9		A17	
			185.75MC	8		A18	
			179.75MC	7		A19	
			87.75MC	6		A20	
			81.75MC	5		A21	
			71.75MC	4		A22	
			65.75MC	3		A23	
			59.75MC	2		A24	

ALIGNMENT INSTRUCTIONS (CONT.)

RF and MIXER ALIGNMENT

The RF and mixer lines of these receivers have been properly aligned at the factory and the adjustments are very stable. Alignment should not be attempted unless they are definitely known to be out of alignment.

The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

Set the contrast control to read 1.5 volts on VTVM connected across C35.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	207MC (10MC Sweep)	205.25MC 209.75MC	12	Vert. Amp. thru 10KΩ to Point ◇ Low side to chassis.	A25, A26, A27	Adjust for response curve similar to Fig 4 with markers above 70%.
12.	"	"	213MC (10MC Sweep)	211.25MC 215.75MC	13	"		Check all channels for response similar to Fig 4. If optimum results are desired on any channel, make slight adjustment of A25, A26, and A27 with channel switch set for that channel. Recheck all channels to see that they have not been seriously effected.
			201MC (10MC Sweep)	199.25MC 203.75MC	11			
			195MC (10MC Sweep)	193.25MC 197.75MC	10			
			189MC (10MC Sweep)	187.25MC 191.75MC	9			
			183MC (10MC Sweep)	181.25MC 185.75MC	8			
			177MC (10MC Sweep)	175.25MC 179.75MC	7			
			85MC (10MC Sweep)	83.25MC 87.75MC	6			
			79MC (10MC Sweep)	77.25MC 81.75MC	5			
			69MC (10MC Sweep)	67.25MC 71.75MC	4			
			63MC (10MC Sweep)	61.25MC 65.75MC	3			
			57MC (10MC Sweep)	55.25MC 59.75MC	2			

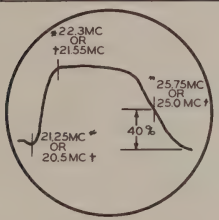


FIG. 1

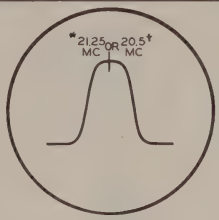


FIG. 2

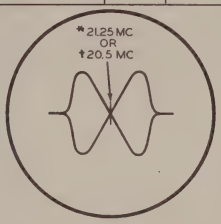


FIG. 3

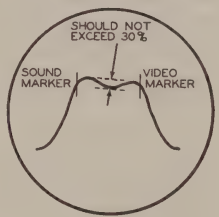


FIG. 4

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

HORIZONTAL OSCILLATOR AND LINEARITY ADJUSTMENTS

Tune in a TV station, preferably a test pattern, and sync the picture vertically with the vertical hold control.

Turn the horizontal hold control to its maximum clockwise position. Adjust the horizontal frequency trimmer (B1), and the horizontal frequency slug (B2) until the picture is just out of sync and the blanking bar appears in the picture as a vertical bar.

Turn the horizontal hold control 1/4 turn counter-clockwise: the picture should synchronize normally.

Adjust the horizontal drive (B3), horizontal width (B4), and the horizontal linearity (B5) alternately until the picture is symmetrical from left to right. If adjustment of B3, B4, or B5 was necessary, repeat the adjustments of B1, and B2.

HORIZONTAL WAVEFORM ADJUSTMENT

Connect the verical amplifier of an oscilloscope thru 1 megohm to terminal "C" of the horizontal oscillator transformer.

Turn the horizontal hold control to sync the picture horizontally.

Adjust the waveform adjustment (B6) until the broad and narrow peaks are of equal amplitudes (See Fig. 5 below). If necessary, keep the picture in sync with the hold controls while making this adjustment.

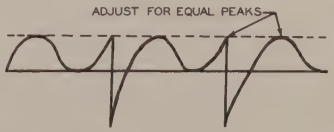


FIG. 5

HORIZONTAL LOCKING RANGE ADJUSTMENT

Turn the horizontal hold control fully counter-clockwise and momentarily interrupt the signal by switching to another channel and back again.

Slowly turn the hold control clockwise and note the least number of bars present just before the picture falls into synchronization.

If more than three bars are present, turn the horizontal lock trimmer (B7) 1/2 turn counter-clockwise. If less than three bars are present, turn B7 1/2 turn clockwise.

Repeat this check and adjustment procedure until three bars are present just before the picture falls into synchronization.

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	-.7VDC	0V	6.3VAC	0V	100VDC	100VDC	0V		
V 2	6J6	95VDC	75VDC	6.3VAC	0V	-1.6VDC	§-4.8VDC	0V		
V 3	6AU6	-.4VDC	0V	6.3VAC	0V	120VDC	120VDC	.6VDC		
V 4	6AU6	-.3VDC	0V	6.3VAC	0V	120VDC	120VDC	.6VDC		
V 5	6AU6	0V	0V	6.3VAC	0V	117VDC	117VDC	16VDC		
V 6	6AU6	0V	0V	6.3VAC	0V	117VDC	117VDC	1.1VDC		
V 7	6AL5	10VDC	-.2VDC	6.3VAC	0V	0V	0V	0V		
V 8	12AU7	105VDC	-.8VDC	0V	6.3VAC	6.3VAC	¶160VDC	¶2.3VDC	¶87VDC	0V
V 9	6AU6	0V	0V	6.3VAC	0V	112VDC	112VDC	.7VDC		
V 10	6AU6	0V	0V	6.3VAC	0V	112VDC	112VDC	.9VDC		
V 11	6AL5	0V	-.3VDC	6.3VAC	0V	-.3VDC	0V	-.3VDC		
V 12	6AU6	-.6VDC	0V	6.3VAC	0V	105VDC	25VDC	0V		
V 13	6V6GT	0V	0V	220VDC	240VDC	0V	0V	6.3VAC	15VDC	
V 14	6C4	-6.2VDC	0V	0V	6.3VAC	-6.2VDC	-6.2VDC	0V		
V 15	6SN7GT	-1VDC	170VDC	0V	-6.2VDC	260VDC	2.4VDC	6.3VAC	0V	
V 16	6SN7GT	¶-2.6VDC	¶35VDC ¶97VDC	¶0V	¶0V	¶285VDC	¶7VDC ¶14VDC	6.3VAC	0V	
V 17	6SN7GT	¶-2.2VDC	¶100VDC	¶2VDC	¶-32VDC	¶165VDC	¶0V	6.3VAC	0V	
V 18	6BG6G	0V	6.3VAC	¶10VDC	¶-.3VDC	¶-.5VDC	¶5.4VDC	0V	¶250VDC	TOP CAP ♦
V 19	6W4GT	0V	0V	320VDC	0V	250VDC	240VDC	▲120VDC	▲120VDC	
V 20	1B3GT	♦ DO NOT MEASURE								
V 21	5U4G	0V	260VDC	0V	325VAC	0V	325VAC	0V	260VDC	
V 22	10BP4	▲120VDC	70VDC	PIN 10 310VDC	PIN 11 160VDC	PIN 12 ▲120VDC				

§ Taken with vacuum tube voltmeter.
¶ Measured from pin 3 of V16.
▲ 6.3VAC measured across filament.
Note. Contrast control set at maximum for these measurements.

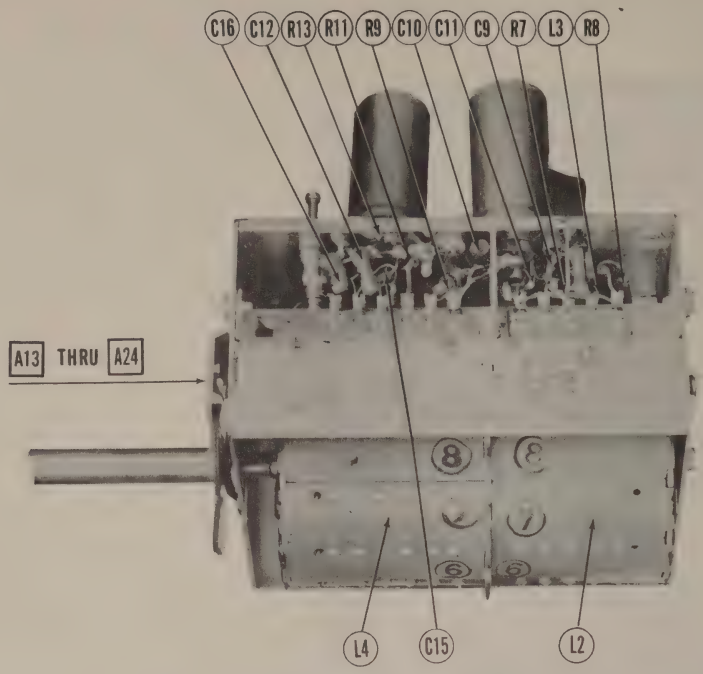
RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	2.3 Meg.	0Ω	.1Ω	0Ω	†3.6KΩ	†3.6KΩ	0Ω		
V 2	6J6	†6KΩ	†16KΩ	.1Ω	0Ω	220KΩ	10KΩ	0Ω		
V 3	6AU6	2.3 Meg.	0Ω	.1Ω	0Ω	†1.4KΩ	†1.4KΩ	82Ω		
V 4	6AU6	2.3 Meg.	0Ω	.1Ω	0Ω	†1.5KΩ	†1.5KΩ	82Ω		
V 5	6AU6	2.3 Meg.	0Ω	.1Ω	0Ω	†1.6KΩ	†1.6KΩ	82Ω		
V 6	6AU6	.2Ω	0Ω	.1Ω	0Ω	†1.7KΩ	†1.7KΩ	180Ω		
V 7	6AL5	3KΩ	2KΩ	.1Ω	0Ω	.2Ω	0Ω	100KΩ		
V 8	12AU7	†4.8KΩ	600KΩ	0Ω	.1Ω	.1Ω	†5.8KΩ	1 Meg.	¶180Ω	0Ω
V 9	6AU6	0Ω	0Ω	.1Ω	0Ω	†2.4KΩ	†2.4KΩ	82Ω		
V 10	6AU6	0Ω	0Ω	.1Ω	0Ω	†2.4KΩ	†2.4KΩ	120Ω		
V 11	6AL5	0Ω	20KΩ	.1Ω	0Ω	Inf.	0Ω	Inf.		
V 12	6AU6	4.7 Meg.	0Ω	.1Ω	0Ω	†470KΩ	†2.2 Meg.	39Ω		
V 13	6V6GT	0Ω	0Ω	†1.5KΩ	†1000Ω	470KΩ	1Ω	.1Ω	680Ω	
V 14	6C4	4.7 Meg.	Inf.	0Ω	.1Ω	4.7 Meg.	4.7 Meg.	0Ω		
V 15	6SN7GT	1 Meg.	†15KΩ	0Ω	4.7 Meg.	†50Ω	6.8KΩ	.1Ω	0Ω	
V 16	6SN7GT	1.1 Meg.	#3 Meg. #1.5Meg.	¶0Ω	¶2.2Meg.	†5KΩ	¶5.5KΩ ¶560Ω	.1Ω	0Ω	
V 17	6SN7GT	1 Meg.	#180KΩ	¶300KΩ	¶250KΩ	#130KΩ	¶0Ω	.1Ω	0Ω	
V 18	6BG6G	Inf.	.1Ω	¶86Ω	¶280KΩ	¶280KΩ	¶47Ω	0Ω	#10KΩ	TOP CAP #200Ω
V 19	6W4GT	Inf.	Inf.	190KΩ	Inf.	†50Ω	†560KΩ	†1.4KΩ	†1.4KΩ	
V 20	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP #590Ω
V 21	5U4G	Inf.	7KΩ	Inf.	♦25Ω	Inf.	♦27Ω	Inf.	7KΩ	
V 22	10BP4	†1.4KΩ	†5.5KΩ	PIN 10 #56KΩ	PIN 11 200KΩ	PIN 12 †1.4KΩ				

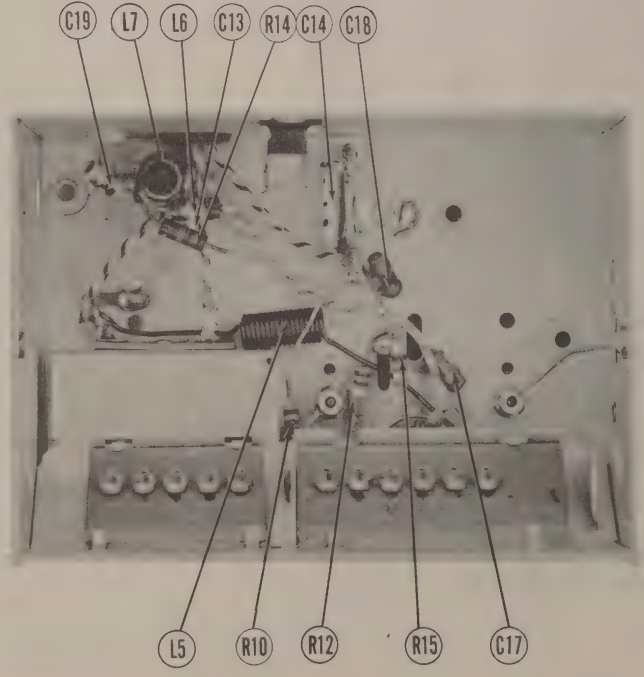
† Measured from pin 8 of V21.
# Measured from from pin 3 of V19.
♦ Measured from center tap of power transformer.
¶ Measured from pin 3 of V16.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.

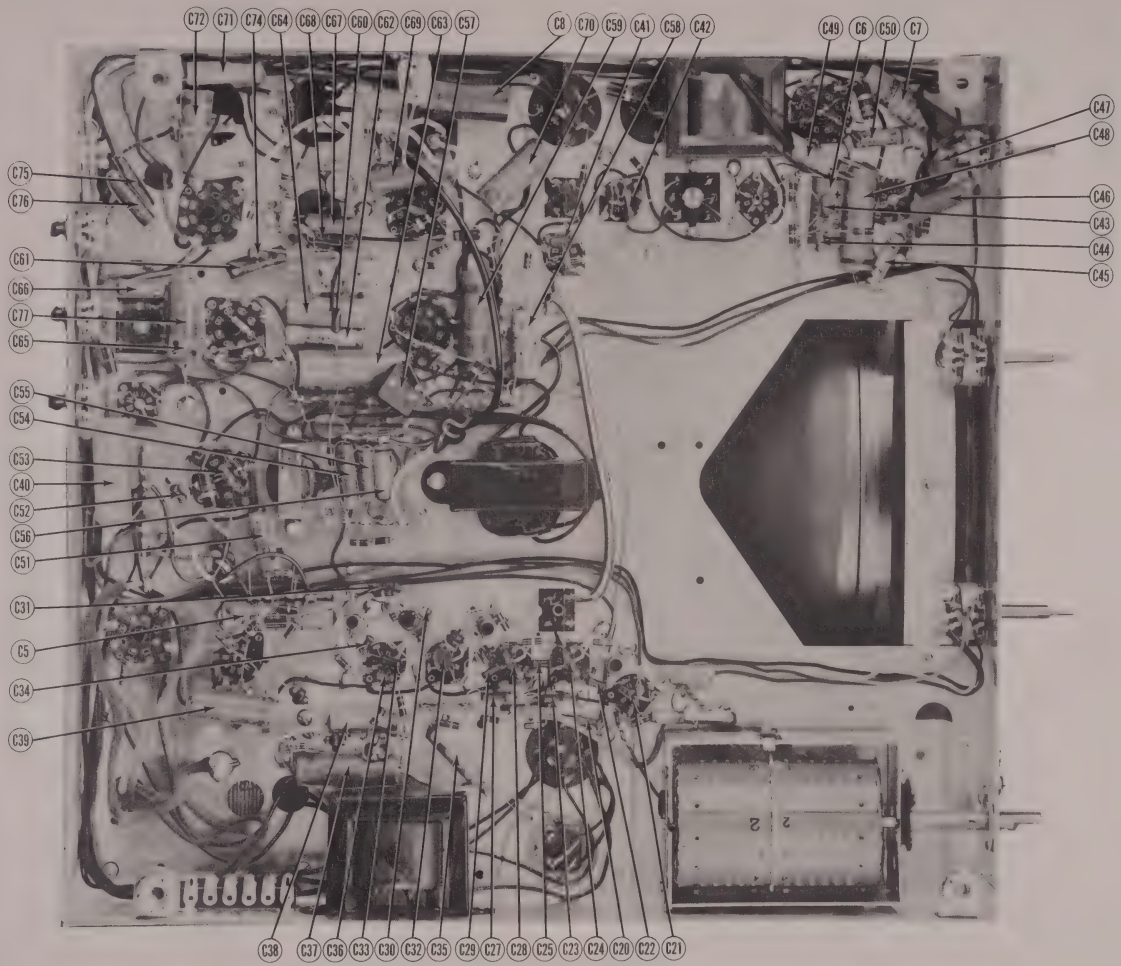
TOR AND ALIGNMENT IDENTIFICATION



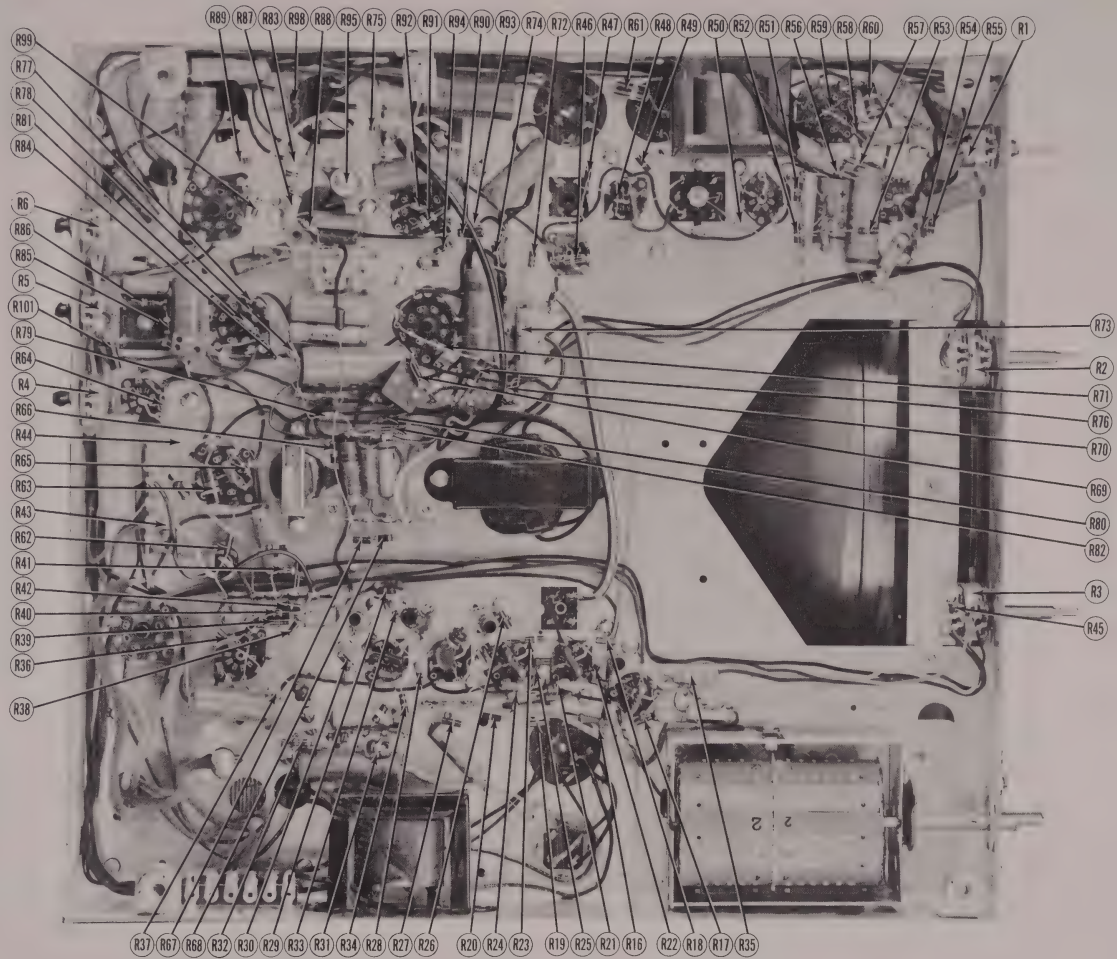
RF TUNER-RIGHT SIDE



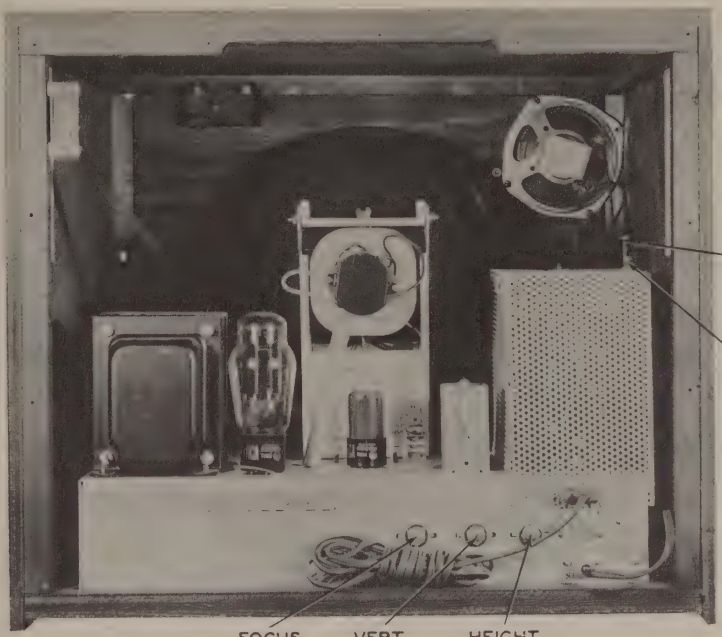
RF TUNER-BOTTOM VIEW



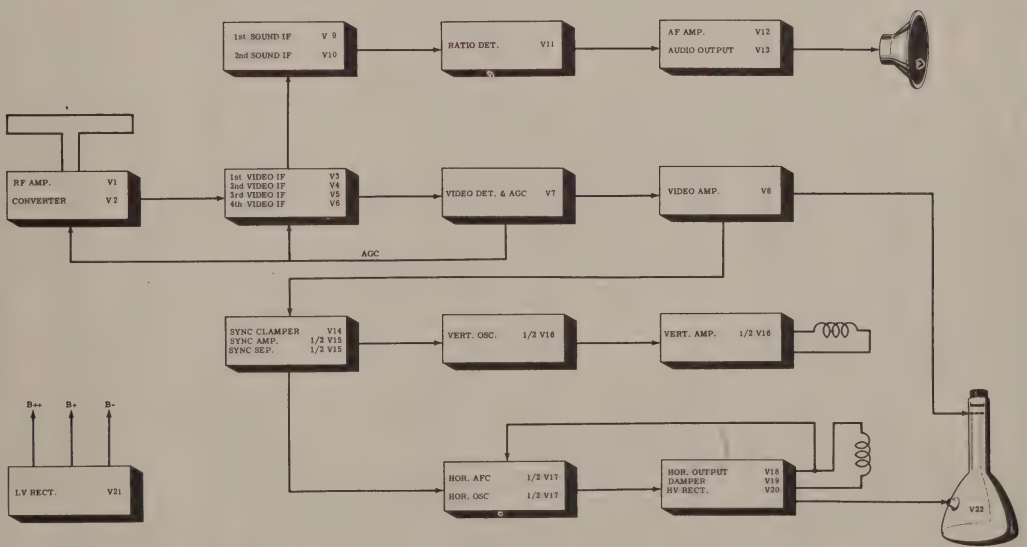
CHASSIS BOTTOM VIEW–CAPACITOR IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



CABINET-REAR VIEW



BLOCK DIAGRAM

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: PACKARD-BELL PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6AG5	6AG5	7BD	
V2	Converter	6J6	6J6	7BF	
V3	1st Video IF	6AU6	6AU6	7BK	
V4	2nd Video IF	6AU6	6AU6	7BK	
V5	3rd Video IF	6AU6	6AU6	7BK	
V6	4th Video IF	6AU6	6AU6	7BK	
V7	Video Det. -AGC Rectifier	6AL5	6AL5	6BT	
V8	Video Amp.	12AU7	12AU7	9A	
V9	1st Sound IF	6AU6	6AU6	7BK	
V10	2nd Sound IF	6AU6	6AU6	7BK	
V11	Ratio Det.	6AL5	6AL5	6BT	
V12	AF Amp.	6AU6	6AU6	7BK	
V13	Audio Output	6V6GT	6V6GT	7AC	
V14	Sync. Clamper	6C4	6C4	6BG	
V15	Sync. Amp.-Sync. Sep.	6SN7GT	6SN7GT	8BD	
V16	Vert. Osc.-Vert. Amp.	6SN7GT	6SN7GT	8BD	
V17	Hor. AFC-Hor. Osc.	6SN7GT	6SN7GT	8BD	
V18	Hor. Output	6BG6G	6BG6G	5BT	
V19	Damper	6W4GT	6W4GT	4CG	
V20	HV Rectifier	1B3GT	1B3GT	3C	
V21	LV Rectifier	5U4G	5U4G	5T	
V22A	Picture Tube	10BP4	10BP4	12D	
B	Picture Tube	10FP4	10FP4	12D	
C	Picture Tube	12BP4	12BP4	12D	
D	Picture Tube	12KP4	12KP4	12D	
E	Picture Tube	12QP4	12QP4	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Packard-Bell PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	450	24049	AF82J16D	UP9CJ729		TVL-25	▲ Filter
B	10	450						■ Vert. Output Decoupling
C	80	150						▲ Filter
C2A	40	450	24048	AF88J2K	UP9CJ1085		TVL-64	▲ Filter
B	40	450					UT-85	■ Filter
C	10	500						▲ Decoupling
C3A	40	450	24048	AF882J	UP9CJ897		TVL-30	▲ Filter
B	40	450						■ Filter
C	10	450						▲ Decoupling
C4	40	450	24014	AF8J	UP4045		TVL-45	Output Decoupling
C5	25	25	24006	PRS25/25	BR252A		TVA-6	2nd V. Amp. Cath. Bypass
C6	5	50	24038	PRSI50/4	BR550		TVA-13	Stabilizing Cap.
C7	25	25	24006	PRS25/25	BR252A		TVA-6	Output Cath. Bypass
C8	150	50	24052	PRS50/100 PRS50/50	BRH501		TVA-16 TVA-17	Vert. Output Cath. Bypass
C9	5					NPOK-5		Fixed Trimmer
C10	120					GP2K-120		RF Decoupling
C11	1000					GP2L-001		RF Filament Bypass
C12	100					N750L-100		RF Coupling
C13	10					NPOK-10		Fixed Trimmer
C14	72							Fixed Trimmer
C15	20					NPOK-20		Osc. Grid Cap.
C16	10					N750K-10		Fixed Trimmer
C17	1000					GP2L-001		Osc. Filament Bypass
C18	1000					GP2L-001		RF Bypass
C19	300					GP2K-300		IF Coupling
C20	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	AGC Filter
C21	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	RF Bypass
C22	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C23	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	AGC Filter
C24	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	2nd IF Decoupling
C25	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C26	47			1469-00005	5R5Q5	NPOM-50	MS-45	Fixed Trimmer
C27	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	AGC Filter
C28	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	3rd V. IF Decoupling
C29	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C30	50			1469-00005	5R5Q5	N750L-47	MS-45	Fixed Trimmer
C31	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	4th V. IF Cath. Bypass
C32	5000			1467-005	1D5D5	811-005	29C1	4th V. IF Decoupling
C33	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C34	470		23916	1468-0005	5W5T5	GP2K-470	1FM-35	IF Coupling
C35	.05	200	23010	P288-05	GT2S5		TM-15	AGC Filter
C36	330		23944	1468-00035	5W5T3	GP2K-330	1FM-335	AGC Filter
C37	.25	200	23021	P488-25	GT2P25		TC-2	AGC Filter
C38	.05	200	23010	P288-05	GT2S5		TM-15	Video Coupling
C39	.05	600	23010	P688-05	GT6S5		TM-15	Video Coupling
C40	.2	400	23020	P488-22	GT4P2		TC-2	Pic. Tube Cath. Dec.
C41	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	1st S. IF Decoupling
C42	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	2nd S. IF Decoupling
C43	[illegible]		23911	1468-000025	5W5Q25	GP1K-22	MS-425	Diode Load Cap. *
C44	[illegible]		23911	1468-000025	5W5Q25	GP1K-22	MS-425	Diode Load Cap. *
C45	.003	600	23016	P688-003	GT6D3	GP2M-003	TM-23	De-emphasis
C46	.05	200	23010	P288-05	GT2S5		TM-15	Audio Coupling
C47	.05	200	23010	P288-05	GT2S5		TM-15	Audio Coupling
C48	.2	400	23020	P488-22	GT4P2		TC-2	AF Screen Bypass
C49	.02	600	23007	P688-02	GT6S2		TM-12	Audio Coupling
C50	.005	600	23004	P688-005	GT6D5	GP2M-005	TM-25	Output Plate Bypass
C51	.05	200	23010	P288-05	GT2S5		TM-15	Sync. Coupling
C52	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	Sync. Coupling
C53	390		23945	1468-0004	5W5T4	GP2K-390	1FM-34	Sync. Sep. Cathode Bypass
C54	.002	600	23002	P688-002	GT6D2	GP2M-002	TM-22	Integrator Net.
C55	.005	600	23004	P688-005	GT6D5	GP2M-005	TM-25	Integrator Net.

PARTS LIST AN

CAPACIT

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT: Packard-Bell PART No.	REPLACEMENT: AEROVOX PART No.	REPLACEMENT: CORN DUBI PART
C56	.005	600	23004	P688-005	GT6D
C57	4900	500	23207	1467-005	1D5D
C58	.1	400	23011	P488-1	GT4P
C59	.25	200	23021	P488-25	GT2P
C60	100		23914	1468-0001	5W5T
C61	.002	600	23002	P688-002	GT6D
C62	.02	600	23007	P688-02	GT6S
C63	.2	400	23020	P488-22	GT4P
C64	.05	600	23010	P688-05	GT6S
C65	180	500	23216		
C66	.01	500	23023	P688-01	GT6S
C67	.002	600	23002	P688-002	GT6D
C68	.01	500	23023	P688-01	GT6S
C69	.05	600	23010	P688-05	GT6S
C70	.1	400	23011	P488-1	GT4P
C71	.033	400	23026	P488-033	
C72	.05	600	23010	P688-05	GT6S
C73	500	10000	23938		
C74	5		23919	1468-000005	5W5V
C75	.01	125AC	23932	P688-01	GT6S
C76	.01	125AC	23932	P688-01	GT6S
C77	.05	600	23010	P688-05	GT6S

* When either items C43 or C44 are replaced, replace bo

CO

ITEM No.	RATING: RESIST-ANCE	RATING: WATTS	REPLACEMENT DATA: Packard-Bell PART No.	REPLACEMENT DATA: IRC PART No.	CLA PA
R1A	500KΩ	½	25022	Q13-133	M-60
B	Switch		Not Req.	76-1	SW-A
R2A	1 Meg.	½	25820	B11-137 *	
B	50KΩ	½		B11-123 *	
C	Shaft End			E202 *	
R3A	500KΩ	½	25821	B11-133 *	
B	5000Ω	½		B11-114 *	
C	Shaft End			E202 *	
R4	5000Ω	½	25807	Q11-114	M-19
R5	5000Ω	½	25807	Q11-114	M-19
R6	3 Meg.	½	25805D	Q11-140	

* Additional parts to be used with "Concentrikit".

RE

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: PACKARD-BELL PART No.	REPLACEMENT DATA: IRC PART No.
R7	3900Ω 20%	½		BTS-3900
R8	47KΩ 20%	½		
R9	10KΩ 20%	½		
R10	2200Ω 20%	½		BTS-2200
R11	4700Ω	½		
R12	220KΩ 20%	½		
R13	10KΩ 20%	½		
R14	15KΩ 20%	½		
R15	4700Ω	½		
R16	8200Ω	½	73036	BTS-8200
R17	82Ω	½	73012	
R18	100Ω	½	73013	
R19	120Ω	½	73014	
R20	120Ω	½	73014	
R21	8200Ω	½	73036	BTS-8200
R22	82Ω	½	73012	
R23	100Ω	½	73013	
R24	4700Ω	½	73033	BTS-4700
R25	82Ω	½	73012	
R26	100Ω	½	73013	
R27	120Ω	½	73014	
R28	2.2 Meg. 20%	½	73165	BTS-2.2 Me
R29	180Ω	½	73016	
R30	8200Ω	½	73036	BTS-8200
R31	4700Ω	½	73033	BTS-4700
R32	3300Ω	½	73031	BTS-3300
R33	100KΩ 20%	½	73149	BTS-100K
R34	2700Ω	½	73030	BTS-2700
R35	33KΩ	1	73243	BTA-33K
R36	1 Meg. 20%	½	73161	BTS-1 Meg.
R37	1.5 Meg. 20%	½	73163	BTS-1.5 Meg
R38	3300Ω	½	73031	BTS-3300
R39	1 Meg. 20%	½	73161	BTS-1 Meg.
R40	180Ω	½	73016	
R41	3300Ω	½	73031	BTS-3300
R42	1000Ω	½	73025	BTS-1000
R43	10KΩ	½	73037	BTS-10K
R44	330KΩ 20%	½	73155	BTS-330K
R45	100KΩ 20%	½	73149	BTS-100K
R46	82Ω	½	73012	
R47	1000Ω	½	73025	BTS-1000
R48	120Ω	½	73014	
R49	1000Ω	½	73025	BTS-1000
R50	470Ω	1	73021	BTA-470
R51	10KΩ	½	73037	BTS-10K
R52	10KΩ	½	73037	BTS-10K
R53	22KΩ	½	73041	BTS-22K
R54	4.7 Meg. 20%	½	73169	BTS-4.7 Me
R55	39Ω	½	73008	BW-½-39
R56	470KΩ 20%	½	73157	BTS-470K
R57	2.2 Meg.	½	73165	BTS-2.2 Me
R58	2200Ω	½	73029	BTS-2200
R59	470KΩ 20%	½	73157	BTS-470K

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: PACKARD-BELL PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6AG5	6AG5	7BD	
V2	Converter	6J6	6J6	7BF	
V3	1st Video IF	6AU6	6AU6	7BK	
V4	2nd Video IF	6AU6	6AU6	7BK	
V5	3rd Video IF	6AU6	6AU6	7BK	
V6	4th Video IF	6AU6	6AU6	7BK	
V7	Video Det.-AGC Rectifier	6AL5	6AL5	6BT	
V8	Video Amp.	12AU7	12AU7	9A	
V9	1st Sound IF	6AU6	6AU6	7BK	
V10	2nd Sound IF	6AU6	6AU6	7BK	
V11	Ratio Det.	6AL5	6AL5	6BT	
V12	AF Amp.	6AU6	6AU6	7BK	
V13	Audio Output	6V6GT	6V6GT	7AC	
V14	Sync. Clamper	9C4	9C4	9BG	
V15	Sync. Amp.-Sync. Sep.	6SN7GT	6SN7GT	8BD	
V16	Vert. Osc.-Vert. Amp.	6SN7GT	6SN7GT	8BD	
V17	Hor. AFC-Hor. Osc	6SN7GT	6SN7GT	8BD	
V18	Hor. Output	6BG6G	6BG6G	9CV	
V19	Damper	6W4GT	6W4GT	4CG	
V20	HV Rectifier	1B3GT	1B3GT	3C	
V21	LV Rectifier	5U4G	5U4G	5T	
V22A	Picture Tube	10BP4	10BP4	12D	
B	Picture Tube	10FP4	10FP4	12D	
C	Picture Tube	12BP4	12BP4	12D	
D	Picture Tube	12KP4	12KP4	12D	
E	Picture Tube	12QP4	12QP4	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Packard-Bell PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	450	24049	AF8Z216D	UP9CJ729		TVL-25	▲ Filter
B	10	450						■ Vert. Output Decoupling
C	80	150						▲ Filter
C2A	40	450	24048	AF88J2K	UP9CJ1085		TVL-64	▲ Decoupling
B	40	450					UT-85	■ Filter
C	10	500						▲ Decoupling
C3A	40	450	24048	AF9821	UP9CJ897		TVL-30	▲ Filter
B	40	450						■ Filter
C	10	450						▲ Decoupling
C4	40	450	24014	AF8J	UP4045		TVL-45	Output Decoupling
C5	25	25	24006	PRS25 25	BR252A		TVA-6	2nd V. Amp. Cath. Bypass
C6	5	50	24038	PRS150/4	BR550		TVA-13	Stabilizing Cap.
C7	25	25	24006	PRS25/25	BR252A		TVA-6	Output Cath. Bypass
C8	150	50	24052	PRS150/100	BRH501		TVA-16	Vert. Output Cath. Bypass
				PRS50/50			TVA-17	
C9	5					NPOK-5		Fixed Trimmer
C10	120					GP2K-330		RF Decoupling
C11	1000					GP2L-001		RF Filament Bypass
C12	100					N750L-100		RF Coupling
C13	10					NPOK-10		Fixed Trimmer
C14	72							Fixed Trimmer
C15	20					NPOK-20		Osc. Grid Cap.
C16	10					N750K-10		Fixed Trimmer
C17	1000					GP2L-001		Osc. Filament Bypass
C18	1000					GP2L-001		▲ Decoupling
C19	300					GP2K-300		RF Bypass
C20	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	IF Coupling
C21	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	AGC Filter
C22	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	RF Bypass
C23	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	IF Coupling
C24	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	AGC Filter
C25	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	2nd IF Decoupling
C26	47			1469-00005	5R5Q5	NPOM-50	MS-45	IF Coupling
C27	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	Fixed Trimmer
C28	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	AGC Filter
C29	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	3rd V. IF Decoupling
C30	50			1469-00005	5R5Q5	N750L-47	MS-45	IF Coupling
C31	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	Fixed Trimmer
C32	5000			1467-005	1D5D5	81L-005	29C1	4th V. IF Cath. Bypass
C33	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	4th V. IF Decoupling
C34	470		23916	1468-0003	5W5T5	GP2K-470	1FM-35	IF Coupling
C35	.05	200	23010	P288-05	GT2S5		TM-15	IF Coupling
C36	330		23944	1468-00035	5W5T3	GP2K-330	1FM-333	AGC Filter
C37	25	200	23021	P488-25	GT4P25		TC-2	AGC Filter
C38	.05	200	23010	P288-05	GT2S5		TM-15	Video Coupling
C39	.05	600	23010	P688-05	GT6S5		TM-15	Video Coupling
C40	.2	400	23020	P488-22	GT4P2		TC-2	Pic. Tube Cath. Dec.
C41	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	1st S. IF Decoupling
C42	1500		23936	1467-0015	1W5D15	GP2L-0015	1FM-215	2nd S. IF Decoupling
C43	22		23911	1468-000025	5W5Q25	GP1K-22	MS-425	Diode Load Cap. *
C44	22		23911	1468-000025	5W5Q25	GP1K-22	MS-425	Diode Load Cap. *
C45	.003	600	23018	P688-003	GT6D3	GP2M-003	TM-23	De-emphasis
C46	.05	200	23010	P288-05	GT2S5		TM-15	Audio Coupling
C47	.05	200	23010	P288-05	GT2S5		TM-15	Audio Coupling
C48	.2	400	23020	P488-22	GT4P2		TC-2	AF Screen Bypass
C49	.02	600	23007	P688-02	GT6S2		TM-12	Audio Coupling
C50	.005	600	23004	P688-005	GT6D5	GP2M-005	TM-25	Output Plate Bypass
C51	.05	200	23010	P288-05	GT2S5		TM-15	Sync. Coupling
C52	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	Sync. Coupling
C53	390		23945	1468-0004	5W5T4	GP2K-390	1FM-34	Sync. Sep. Cathode Bypass
C54	.002	600	23002	P688-002	GT6D2	GP2M-002	TM-22	Integrator Net.
C55	.005	600	23004	P688-005	GT6D5	GP2M-005	TM-25	Integrator Net.

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Packard-Bell PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C56	.005	600	23004	P688-005	GT6D5	GP2M-005	TM-25	Integrator Net.
C57	4900	500	23207	1467-005	1D5D5	GP2M-005	1FM-25	Vert. Osc. Grid Cap.
C58	.1	400	23011	P488-1	GT4P1		TM-1	Vert. Discharge
C59	.25	200	23031	P488-25	GT2P25		TC-2	Vert. Sweep Coupling
C60	100		23914	1468-0001	5W5T1	GP1K-100	1FM-31	Hor. Sync. Coupling
C61	.002	600	23002	P688-002	GT6D2	GP2M-002	TM-22	Hor. Sync. Coupling
C62	.02	600	23007	P688-02	GT6S2		TM-12	AFC Filter
C63	.2	400	23020	P488-23	GT4P2		TC-2	AFC Filter
C64	.05	600	23010	P688-05	GT6S5		TM-15	AFC Plate Bypass
C65	180	500	23218			GP2K-180		Hor. Osc. Grid Cap.
C66	.01	500	23023	P688-01	GT6S1	GP2-335-01	TM-11	Fixed Trimmer
C67	.002	600	23002	P688-002	GT6D2	GP2M-002	TM-22	Hor. Discharge
C68	.01	500	23023	P688-01	GT6S1	GP2-335-01	TM-11	Hor. Sweep Coupling
C69	.05	600	23010	P688-05	GT6S5		TM-15	Hor. Output Screen Bypass
C70	.1	400	23011	P488-1	GT4P1		TM-1	Hor. Output Cath. Bypass
C71	.033	400	23026	P488-033				Damper Filter
C72	.05	600	23010	P688-05	GT6S5		TM-15	Damper Filter
C73	500	10000	23938					HV Filter
C74	5		23918		M68-000005	5W5Y5	N750K-5	MS-55	Hor. Feedback
C75	.01	125AC	23933	P688-01	GT6S1			TM-11	Line Filter
C76	.01	325AC	23933	P688-01	GT6S1			TM-11	Line Filter
C77	.05	600	23010	P688-05	GT6S5			TM-15	RF Bypass

* When either items C43 or C44 are replaced, replace both with capacitors of equal value.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: Packard-Bell PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	500KΩ	½	25022	Q13-133	M-50-Z	Volume control
B	Switch		Not Req.	T6-1	SW-A	Attach to R1A per instructions
R2A	1 Meg.	½	25820	B11-137 *		Vert. hold control, front (Dual Concentric)
B	50KΩ	½		B11-133 *		Horiz. hold control, rear
C	Shaft End			E20J *		Attach per instructions in "Concentrikit".
R3A	500KΩ	½	25821	B11-133 *		Brightness control, front (Dual Concentric)
B	5000Ω	½		B11-114 *		Contrast control, rear
C	Shaft End			E20J *		Attach per instructions in "Concentrikit".
R4	500Ω	1	25807	Q11-114	M-10-S	Focus control
R5	5000Ω	1	25807	Q11-114	M-10-S	Vert. linearity control
R6	3 Meg.	½	25805D	Q11-140		Height control

* Additional parts to be used with "Concentrikit".

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: PACKARD-BELL PART No.	IRC PART No.	IDENTIFICATION CODES: ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED.
R7	390Ω 20%	½		BTS-3900	RF Grid
R8	47KΩ 20%	½			AGC Network
R9	10KΩ 20%	½			RF Plate Coil Shunt
R10	2200Ω 20%	½		BTS-2200	RF Decoupling
R11	4700Ω	½			Conv. Grid
R12	220KΩ 20%	½			Conv. Grid
R13	10KΩ 20%	½			Osc. Grid
R14	15KΩ 20%	½			Conv. Plate Decoupling
R15	470Ω	½			Osc. Plate
R16	8300Ω	½	73036	BTS-8300	1st Video IF Grid
R17	82Ω	½	73012		1st Video IF Cathode
R18	10KΩ	½	73013		Decoupling Network
R19	120Ω	½	73014		AGC Network
R20	120Ω	½	73014		AGC Network
R21	8200Ω	½	73036	BTS-8200	2nd Video IF Grid
R22	82Ω	½	73012		2nd Video IF Cathode
R23	100Ω	½	73013		Decoupling Network
R24	4700Ω	½	73033	BTS-4700	3rd Video IF Grid See Note 1
R25	82Ω	½	73012		3rd Video IF Cathode
R26	200Ω	½	73013		Decoupling Network
R27	120Ω	½	73014		AGC Network
R28	2.2 Meg. 20%	½	73165	BTS-2.2 Meg.	AGC Network
R29	180Ω	½	73016		4th Video IF Cathode
R30	8200Ω	½	73036	BTS-8200	Video Det. Diode Load See Note 2
R31	4700Ω	½	73033	BTS-4700	Video Det. Diode Load
R32	3300Ω	½	73031	BTS-3300	Video Det. Diode Load
R33	100KΩ 20%	½	73149	BTS-100K	AGC Rect. Load
R34	2700Ω	½	73030	BTS-2700	AGC Filter Network
R35	33KΩ	½	73243	BTA-33K	Voltage Divider
R36	1 Meg. 20%	½	73161	BTS-1 Meg.	Bias Network
R37	1.5 Meg. 20%	½	73163	BTS-1.5 Meg.	Video Amp. Grid
R38	3300Ω	½	73031	BTS-3300	Video Amp. Plate
R39	1 Meg. 20%	½	73161	BTS-1 Meg.	Video Amp. Grid
R40	180Ω	½	73016		Video Amp. Cathode
R41	3300Ω	½	73031	BTS-3300	Video Amp. Plate
R42	1000Ω	½	73025	BTS-1000	Video Amp. Plate
R43	10KΩ	½	73037	BTS-10K	Acc. Anode Load
R44	330KΩ 20%	½	73185	BTS-330K	Voltage Divider See Note 3
R45	100KΩ 20%	½	73149	BTS-100K	Voltage Divider
R46	82Ω	½	73012		1st Sound IF Cathode
R47	1000Ω	½	73025	BTS-1000	1st Sound IF Decoupling
R48	120Ω	½	73014		2nd Sound IF Cathode
R49	1000Ω	½	73025	BTS-1000	2nd Sound IF Decoupling
R50	470Ω	1	73021	BTA-470	Balancing
R51	10KΩ	½	73037	BTS-10K	Ratio Det. Diode Load
R52	10KΩ	½	73037	BTS-10K	Ratio Det. Diode Load
R53	33KΩ	½	73041	BTS-33K	De-emphasis
R54	4.7 Meg. 20%	½	73169	BTS-4.7 Meg.	AF Grid
R55	39Ω	½	73008	BW-1-39	AF Cathode
R56	470KΩ 20%	½	73157	BTS-470K	AF Plate
R57	2.2 Meg.	½	73165	BTS-2.2 Meg.	AF Screen
R58	2200Ω	½	73029	BTS-2200	Feedback
R59	470KΩ 20%	½	73157	BTS-470K	Output Grid

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: Packard-Bell PART No.	IRC PART No.	IDENTIFICATION CODES
R60	680Ω	II	73423	BT-2-680	Output Cathode
R61	100Ω	2	73425	BW-2-1000	Filter
R62	1 Meg. 20%	½	73161	BTS-1 Meg.	Sync. Amp. Grid
R63	15KΩ	II	73439	BT-2-15K	Sync. Amp. Plate
R64	4.7 Meg. 20%	½	73169	BTS-4.7 Meg.	Sync. Sep. Grid
R65	6800Ω	½	73035	BTS-6800	Sync. Sep. Cathode
R66	22KΩ	½	73041	BTS-22K	Integrator
R67	8200Ω	½	73036	BTS-8200	Integrator
R68	8200Ω	½	73036	BTS-8200	Integrator
R69	1 Meg. 20%	½	73161	BTS-1 Meg.	Vert. Osc. Grid
R70	1 Meg.	½	73171	BTS-6.8 Meg.	Voltage Divider
R71	100KΩ 20%	½	73149	BTS-100K	Voltage Divider
R72	330KΩ	½	73031	BTS-3300	Vert. Peaking
R73	1.5 Meg. 20%	½	73163	BTS-1.5 Meg.	Vert. Osc. Plate
R74	2.2 Meg.	½	73165	BTS-2.2 Meg.	Vert. Amp. Grid
R75	560Ω	½	73032	BTS-560	Vert. Amp. Cathode
R76	3900Ω	1	73232-2	BTA-3900	Vert. Amp. Plate Decoupling
R77	820KΩ	½	73060	BTS-820K	Horiz. AFC Grid
R78	150KΩ 20%	½	73151	BTS-150K	Horiz. AFC Cathode
R79	150KΩ 20%	½	73151	BTS-150K	Horiz. AFC Cathode
R80	8200Ω	½	73036	BTS-8200	Horiz. AFC Filter Network
R81	2.7 Meg.	½	73068	BTS-2.7 Meg.	Voltage Divider
R82	68KΩ 20%	½	73147	BTS-68K	Voltage Divider
R83	120KΩ	1	73250	BTA-120K	Voltage Divider
R84	100KΩ 20%	½	73149	BTS-100K	Horiz. Osc. Grid
R85	8200Ω	½	73036	BTS-8200	Horiz. Osc. Transformer Shunt
R86	22KΩ	½	73041	BTS-22K	Horiz. Osc. Transformer Shunt
R87	120KΩ	1	73250	BTA-120K	Horiz. Osc. Plate
R88	150KΩ 20%	½	73151	BTS-150K	Horiz. AFC Filter Network
R89	100KΩ	½	73037	BTS-10K	Filter
R90	47Ω	1	73209	BW-1-47	Bias Network
R91	39Ω	1	73208	BW-1-39	Horiz. Output Cathode
R92	330KΩ 20%	½	73155	BTS-330K	Horiz. Output Grid
R93	1 Meg. 20%	½	73161	BTS-1 Meg.	Voltage Divider
R94	47Ω	½	73009		Parasitic Supp.
R95	18KΩ	10	73644	AB-18, 000	Horiz. Output Screen, Wire Wound
R96	3.3Ω	1	73279		HV Rect. Filament
R97	820KΩ	1	73260		HV Filter
R98	56KΩ	½	73046	BTS-56K	Filter
R99	560KΩ	½	73058	BTS-560K	Feedback
R100	1MΩ	1	73202	BW-1-1M	Filter, See Note 4
R101	1500Ω 5%	1		BTA-1500-5%	Focus Coil Shunt
R102A	350Ω	20	73667	DG-350	Bias Network , Wire Wound
B	42Ω	1			Bias Network , Wire Wound
R103A	1360Ω	25	73666		Filter, Wire Wound
B	675Ω	5		AB-7000	Bleeder, Wire Wound

Note 1. Some models use 8200Ω resistor in this application.
Note 2. Not used in all models.
Note 3. Not used in early production models.
Note 4. Some models use 5.6Ω resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: PACKARD-BELL PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.
T1	117VAC at 3A	750VCT at .370ADC	5VAC at 3A	6.3VAC at 6.8A SEC. 4 6.3VAC at 1.8A	89032	P-8156 ▲		

▲ Rewire heaters as required.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC.	PACKARD-BELL PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	NOTES
T2	120Ω	36Ω	23048				Hor. Osc. Trans.
	Tap at 85Ω						
T3	230Ω	1350Ω	89031	A-8111 §	A-3000 §	TSO-1 §	Vert. Block Osc. Trans.
T4	470Ω	SEC. 1 10.6Ω	23951	A-8117		TFB-1	Hor. Output Trans.
	Tap at 165Ω	Tap at 8Ω					
		SEC. 2 9Ω					
T5	920Ω	12Ω	89422	A-8113	A-3035	TSO-5	Vert. Output Trans.
T6A	13Ω		29501	DY-1			Hor. Deflection Coil
B	62Ω						Vert. Deflection Coil
T7	340Ω		29521	FC-10			Focus Coil

§ Drill one new mounting hole.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: Packard-Bell PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
T8	5500Ω	3.5Ω	570Ω	.7Ω	89405	A-3825	A-3903 §	RO-9	§ Drill one new mounting hole.

PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			Packard-Bell PART No.	JENSEN PART No.	QUAM PART No.	
	FIELD	V. C. IMP.		ST-105		† Used in models 2293TV and 2294TV.
SP1A	PM	3.6Ω	83202 †	MOD. P5-X	5A1	
B	PM		83302 ‡	ST-108		‡ Used in models 2292TV and 2296TV, and 2297TV STD., 2298TV.
				MOD. P6-X	6A1	
C	PM		83705 #	ST-119 ∅		# Used in models 2291TV, 2295TV and 2297TV Deluxe.
				MOD. P10-T	10A31	
	CONE DIA.	V. C. DIA.				∅ Replace output transformer to match 6-8Ω voice coil.
SP2A	4 3/8"	9/16"	†			
B	6 1/2"		‡			
C	10"		#			

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				INSTALLATION NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 cps)	Packard-Bell PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
L1	.270A	44Ω	1.9 Henries	27005	C-2326	C-2991	TR-3300 §	§ Drill one new mounting hole.

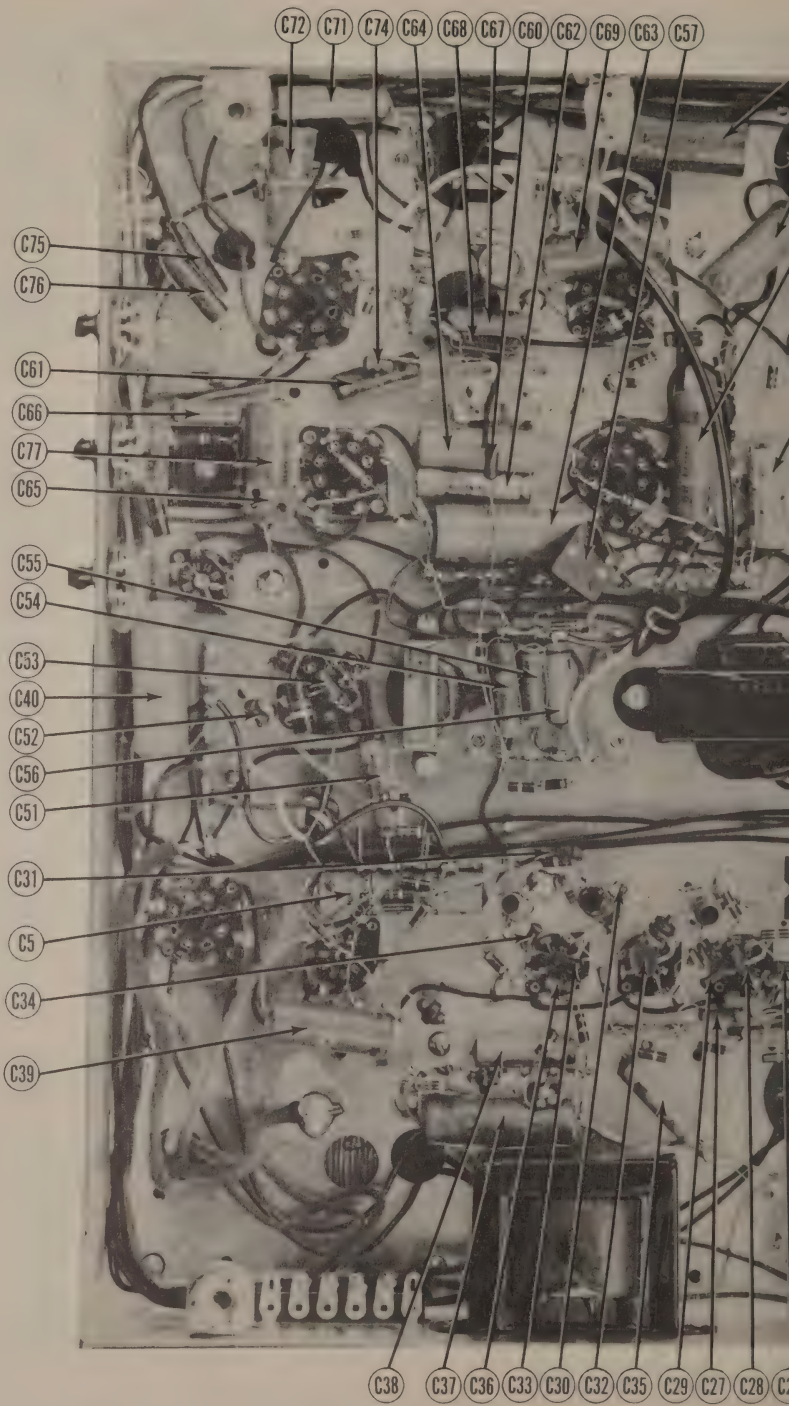
COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA		NOTES
		PRI.	SEC.	Packard-Bell PART No.	MEISSNER PART No.	
L2	Ant. Coils	0Ω				Part of tuner.
L3	Fil. Choke	0Ω				Part of tuner.
L4	RF Mixer Grid & Osc. Coils	0Ω				Part of tuner.
L5	Fil. Choke	0Ω				Part of tuner.
L6	RF Choke	0Ω				Part of tuner.
L7	1st Video IF	0Ω				Part of tuner.
L8	RF Choke	1Ω				3.35 microhenries. Wound on 33KΩ resistor.
L9	2nd Video IF	.2Ω		29028		
L10	3rd Video IF & Sound Take Off	.1Ω		29047		
L11	3rd Video IF Plate Choke	6.7Ω		29115		55 microhenries, some sets may have an 8.2KΩ 1/2 W. carbon resistor in this application.
L12	4th Video IF	.2Ω		29028		
L13	Sound Trap	0Ω	0Ω	29516		
L14	4th Video IF Plate Choke	6.7Ω		29115		55 microhenries.
L15	5th Video IF	.2Ω		29028		
L16	Peaking	3.5Ω		29520		36 microhenries. Black identification dot.
L17	Peaking	7Ω		29508		180 microhenries. Wound on 39KΩ resistor. White identification dot.
L18	Peaking	6.7Ω		29506		120 microhenries. Wound on 22KΩ resistor. Blue identification dot.
L19	Peaking	3.5Ω		29520		36 microhenries. Black identification dot.
L20	Peaking	6.7Ω		29506		120 microhenries. Wound on 22KΩ resistor. Blue identification dot.
L21	Sound IF	0Ω	0Ω	29025		
L22	Ratio Det. Trans.	.1Ω	0Ω	29031		
L23	Width Cont.	.2Ω		29503		
L24	Hor. Linearity	35Ω		29504		

MISCELLANEOUS

ITEM No.	PART NAME	PACKARD - BELL PART No.	NOTES
M1	RF Tuner	10528	
M2	Fuse	45003	Type 3AG - .25 Amp.
M3	Ion Trap		Permanent Type
	Cabinet	21079	Models 2291-TV, 2292-TV, 2295-TV, 2296-TV
	Cabinet	21082	Models 2293-TV, 2294-TV
	Knob	52049	Volume
	Knob	52065	Volume (Models 2297-TV, 2298-TV)
	Knob	52050	Contrast - Bright. or Vert. Hold - Horiz. Hold.
	Knob	52057	Contrast - Bright. or Vert. Hold - Horiz. Hold. (Models 2297-TV, 2298-TV)
	Knob	52044	Channel Selector
	Knob	52064	Channel Selector (Models 2297-TV, 2297-TV)
	Knob	52045	Fine Tuning
	Knob	52054	Fine Tuning (Models 2297-TV, 2298-TV)
	Escutcheon	41027	10" Picture Tube
	Escutcheon	41028	12 1/2" Picture Tube
	Escutcheon	41032	Channel Selector
	Trimmer Strip	23414	Horiz. Lock (10 -160 MMF), Horiz. Freq. (40 - 370 MMF)
	Trimmer	23402	Horiz. Drive (300 - 800 MMF)

ESISTOR IDENTIFICATION



CHASSIS BOTTOM VIEW-

SILVERTONE MODEL
9270 (Ch. 547.245)

SILVERTONE MODEL
9270 (Ch. 547.245)

SILVERTONE MODEL 9270

TRADE NAME	Silvertone, Model 9270 (Ch. 547.245)
MANUFACTURER	Sears, Roebuck and Co., 925 S. Homan St., Chicago, Illinois
TYPE SET	Three Power Operated Portable Superheterodyne Receiver with Loop Antenna
TUBES (FIVE)	Types 1U4 RF Amp., 1R5 Converter, 1U4 IF Amp., 1U5 DET-AVC-AF, 3V4 Power Output
POWER SUPPLY RATING	110-120 Volts AC-DC or 9 Volts "A" Supply and 90 Volts "B" Supply in Pack Form .17 Amp. at 117 Volts AC or 55MA at 9 Volts DC and 17MA at 90 Volts DC
TUNING RANGE—BROADCAST	550-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer turn tuning gang fully open and set the center of the pointer even with the left hand edge of the dial opening in the cabinet.

Use battery power when available. If AC power is used, use an isolation transformer when available. If not, connect a 1MFD capacitor in series with low side of the signal generator and B-.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 6 (Grid) of 1R5 (V2). Low side to B-.	455KC (400 ~ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If AC power is used without an isolation transformer reduce dummy antenna to 200MMF to reduce hum modulation.
2.	.1MFD	High side to stator of rear section of tuning gang. Low side to B-.	1615KC	"	"	A5	"
3.	.1MFD	"	1400KC	1400KC	"	A6	"
4.	.1MFD	"	600KC	600KC	"	A7	"
5.		Loop	1400KC	Tune for max. output.	"	A8	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1950 by Howard W. Sams & Co., Inc., Indianapolis Indiana, U. S. of America. Copyright under International Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	RF Amp.	1U4	1U4	6AR	
V2	Converter	1R5	1R5	7AT	
V3	IF Amp.	1U4	1U4	6AR	
V4	DET.-AVC-AF	1U5	1U5	6BW	
V5	Power Output	3V4	3V4	6BX	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	60	150	V6552	AF12168D20A				● Filter
B	80	150						■ Filter
C	40	150						▲ Filter
D	100	25						Filament Bypass
C2	50	25	V4636	PRS25/50	BR502		TA-50	Filament Bypass
C3	.05	200	V6066-2503M	P285-05	ZYW1S5		68P16	AVC Filter
C4	.05	200	V6066-2503M	P285-05	ZYW1S5		68P16	RF Filament Bypass
C5	100	500	RCM20A101M	1468-0001	5W5T1	GP1K-100	1FM-31	RF Coupling
C6	220	500	RCM20A221M	1468-00025	5W5T25	GP2K-220	1FM-325	RF Coupling
C7	.05	200	V6066-2503M	P285-05	ZYW1S5		68P16	Osc. Anode Bypass
C8	.05	200	V6066-2503M	P285-05	ZYW1S5		68P16	AVC Filter
C9	.15	200	V6066-2154M	P288-15			68P18	Filament Bypass
C10	.002	600	V6066-4202M	P485-002	ZYW4D2	GP2M-002	68P27	Audio Coupling
C11	.05	200	V6066-2503M	P285-05	ZYW1S5		68P16	AF Amp. Screen Bypass
C12	220	500	RCM20A221M	1468-00025	5W5T25	GP2K-220	1FM-325	AF Amp. Plate Bypass
C13	.005	400	V6066-4502M	P485-005	ZYW4D5	GP2M-005	68P6	Audio Coupling
C14	.05	200	V6066-2503M	P285-05	ZYW1S5		68P16	RF Bypass
C15	.002	600	V6066-4202M	P485-002	ZYW4D2	GP2M-002	68P27	Output Plate Bypass
C16	.05	400	V6066-4503M	P485-05	GT4S5		68P10	Line Filter
C17	.15	200	V6066-2154M	P288-15			68P18	Line Isolation

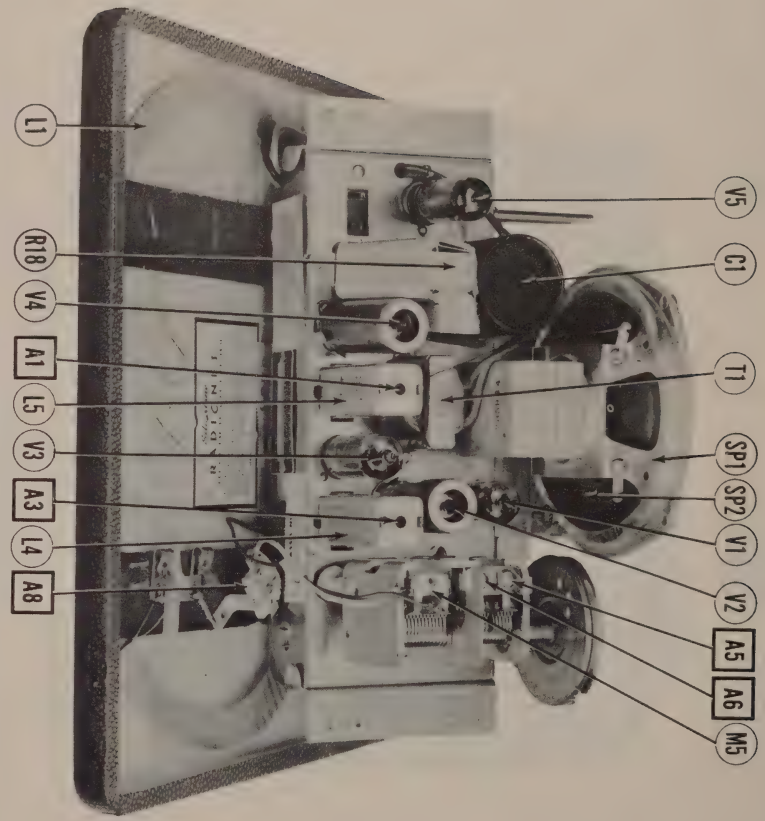
CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1A	500KΩ	½	V5666-3	Q13-133		Volume control
B	Switch		Not Req.	76-2		Attach to R1A per instructions

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R2	27KΩ	½	RC20AE273M	BTS-27K	RF Plate
R3	1 Meg.	½	RC20AE105M	BTS-1 Meg.	Conv. Grid
R4	100KΩ	½	RC20AE104M	BTS-100K	Osc. Grid
R5	10KΩ	½	RC20AE103M	BTS-10K	Osc. Anode Decoupling
R6	6.8 Meg.	½	RC20AE685M	BTS-6.8 Meg.	AVC Network
R7	6.8 Meg.	½	RC20AE685M	BTS-6.8 Meg.	AVC Network
R8	2.2 Meg.	½	RC20AE225M	BTS-2.2 Meg.	IF Grid
R9	10 Meg.	½	RC20AE106M	BTS-10 Meg.	AF Grid
R10	1.5 Meg.	½	RC20AE155M	BTS-1.5 Meg.	AF Screen
R11	470KΩ	½	RC20AE474M	BTS-470K	AF Plate
R12	2.2 Meg.	½	RC20AE225M	BTS-2.2 Meg.	Output Grid
R13	220KΩ	½	RC20AE224M	BTS-220K	Isolation
R14	1000Ω	½	RC20AE102K	BTS-1000	Filament String
R15	2200Ω	½	RC20AE222K	BTS-2200	Filament String
R16	1000Ω	½	RC20AE102K	BTS-1000	Filament String
R17	100Ω	½	RC20AE101M	BW-½-100	Filament Dropping
R18 A	1235Ω	10	V6559	AB-1250	Filament Dropping, Wire Wound
B	1235Ω	10		AB-1250	Filter, Wire Wound
R19	2200Ω	1	RC30AE222K	BW-1-2200	Filter
R20	22Ω	½	RC20AE220M		Surge Limiter

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		SILVERTONE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	10.5KΩ	3.6Ω	435Ω	.5Ω	V6567	A-3329	A-2998	RO-11	

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			SILVERTONE PART No.	JENSEN PART No.	QUAM PART No.	
	FIELD	V. C. IMP.		ST-105		
SP1	PM	3.6Ω	V6555	P5-X	4A1	
	CONE DIA.	V. C. DIA.				
SP2	4 3/8"	9/16"				

R F COILS

ITEM No.	USE	DC RES.		REPLACEMENT DATA		
		PRI.	SEC.	SILVERTONE PART No.	MEISSNER PART No.	
L1	Loop Ant.	4.1Ω		V6952		Includes 3MMF trimmer
L2	RF Coil	12Ω	4Ω CT	V6561		
L3	Osc. Coil	2.7Ω	12.5Ω	V5661		
L4	Input IF	19Ω	19Ω	V6972-3	16-6668	
L5	Output IF	25Ω	25Ω	V6972-4	16-6669	

SELENIUM RECTIFIER

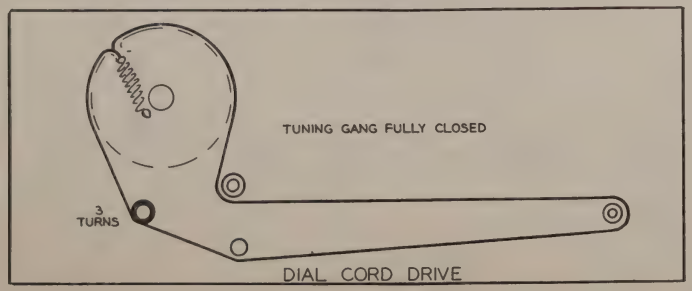
ITEM No.	RATING	REPLACEMENT DATA			NOTES
	CURRENT	SILVERTONE PART No.	SYLVANIA PART No.		
M1	.068A	V6558-1	NB-5		

BATTERIES

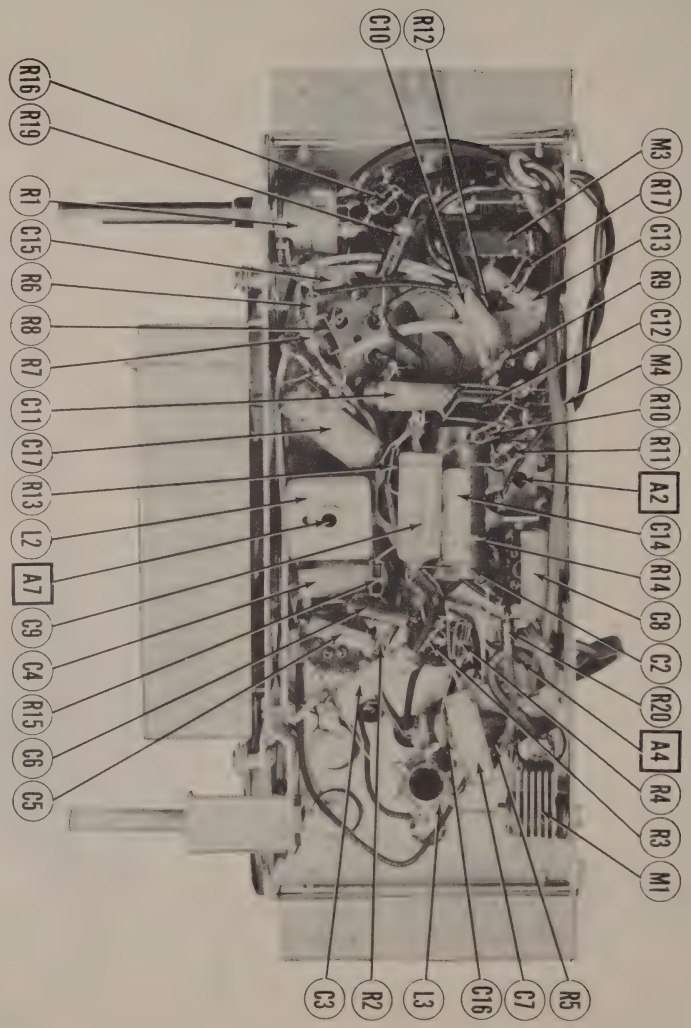
ITEM No.	VOLTAGE	SILVERTONE PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M2	9V "A" 90V "B"	6404			754			G6M60	

MISCELLANEOUS

ITEM No.	PART NAME	SILVERTONE PART No.	NOTES
M3	Switch	V6565	AC/DC-Battery
M4	Diode Filter	V6232-2	
M5	3 Gang. Var. Cap.	V6566	(18-410MMF, 17-405MMF, 13-100MMF)
	Dial Pointer	V6568	
	Cabinet	V1186-1	
	Dial	V6951	
	Knob	V6146-8	

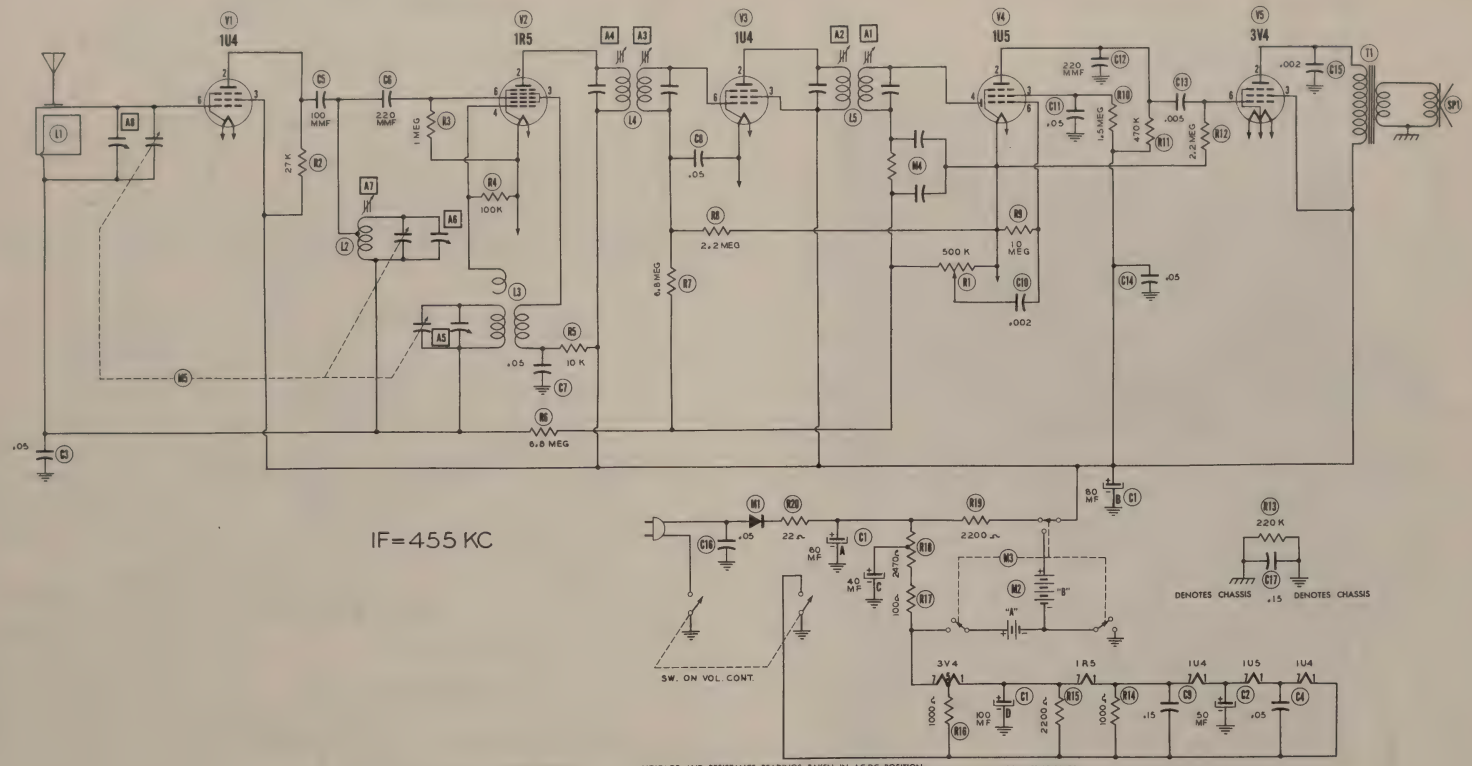


CHASSIS—BOTTOM VIEW



SILVERTONE MODEL 9270

SILVERTONE MODEL 9270



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VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	1U4	0V.	40VDC	93VDC	0V.	0V.	0V.	1.5VDC
V 2	1R5	4.4VDC	93VDC	65VDC	§-7.4VDC	4.4VDC	.6VDC	5.8VDC
V 3	1U4	3VDC	93VDC	93VDC	0V.	3VDC	.2VDC	4.4VDC
V 4	1U5	1.6VDC	20VDC	23VDC	.4VDC	1.6VDC	0V.	3VDC
V 5	3V4	5.8VDC	90VDC	93VDC	0V.	7.2VDC	.2VDC	8.5VDC

§TAKEN WITH VACUUM TUBE VOLTMETER.

VOLTAGE AND RESISTANCE READINGS TAKEN IN AC-DC POSITION.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	1U4	*	130KΩ	†2.2KΩ	Inf.	*	7 Meg.	*
V 2	1R5	*	†2.2KΩ	†12KΩ	100KΩ	*	1 Meg.	*
V 3	1U4	*	†2.2KΩ	†2.2KΩ	Inf.	*	1.5 Meg.	*
V 4	1U5	*	†470KΩ	†1.5Meg.	500KΩ	*	10 Meg.	*
V 5	3V4	*	†2.5KΩ	†2.2KΩ	Inf.	*	2.2 Meg.	*

*DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
† Measured from output of T1.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

MODELS 402, 400-C
V-M

V-M MODEL 402

V-M MODEL 400-C

V-M
MODELS 402, 400-C

GENERAL INFORMATION

The V-M 400-C and 402 record changers are designed to play automatically up to ten 12-inch, twelve 10-inch, or ten records intermixed in any order. The changers will shut off automatically at the completion of the last record. The units are designed to be jam-proof. The pickup arm may be held and the control knob may be turned to any position during the change cycle.

MANUFACTURED BY V-M CORPORATION, BENTON HARBOR, MICHIGAN

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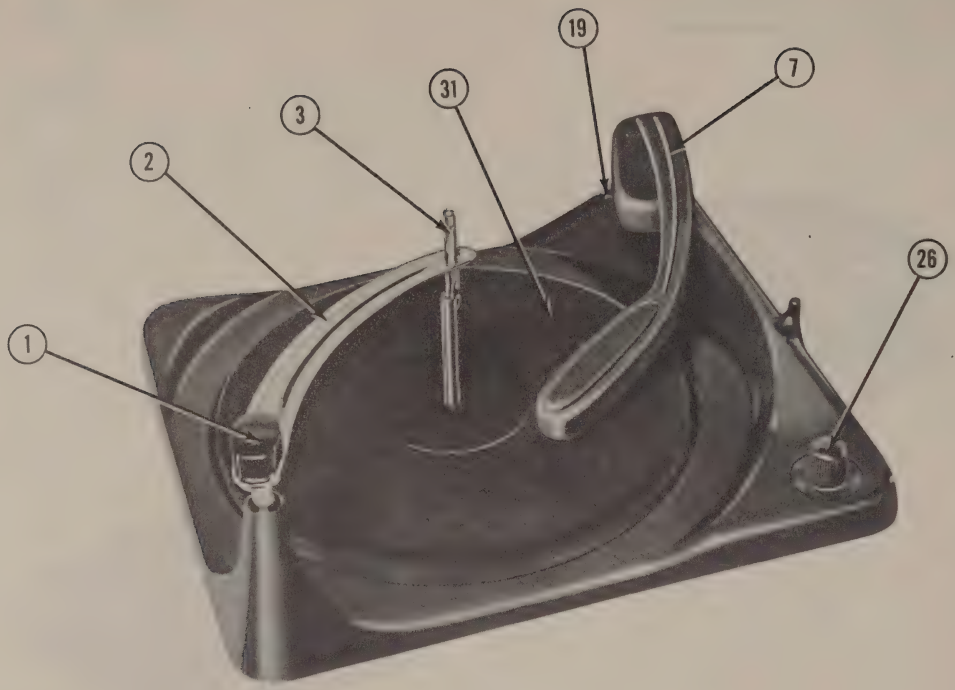


TOP VIEW FIG. 1

PREPARING FOR OPERATION

POWER SUPPLY: Connect only to 110-120 volt, 60-cycle unless otherwise specified. (A special bushing is available for 50-cycle operation—Part No. 2130.)

SHIPPING BOLTS: Before placing in operation, the machine must be floated freely on the mounting springs. During shipping, the mechanism is secured by means of the two shipping bolts. To float the changer, remove the turntable by lifting it straight up the spindle. Remove the two shipping bolts which hold the record changer to the motor board, by turning them in a counter-clockwise direction. Replace the turntable. Before the turntable can be fully seated, the drive wheel must be gently pushed back out of the way to prevent damage to rubber tire.

PICKUP GUARD: Should the pickup device have a protective guard around the stylus, it should be removed as this is used to protect the stylus during transit only.

OPERATING

LOADING: (Refer to Figure 1 for the following reference numbers.)

Pull the record support knob (1) straight up until the record support arm (2) clears the spindle. Swing the record support in either direction until the pin in the shaft drops into the locating groove. Place as many as ten 12-inch, twelve 10-inch, or ten records intermixed on the offset shoulder on the spindle. Steady the records with one hand and replace the record support over the spindle. Gently press down on the record support knob until records are held parallel with the turntable.

STARTING: Turn the control knob (26) clockwise to "Rej." and release. The changer will operate automatically until the last record has been played. The control knob turns to the "Off" position, the pickup arm (7) returns to rest, and the machine automatically stops.

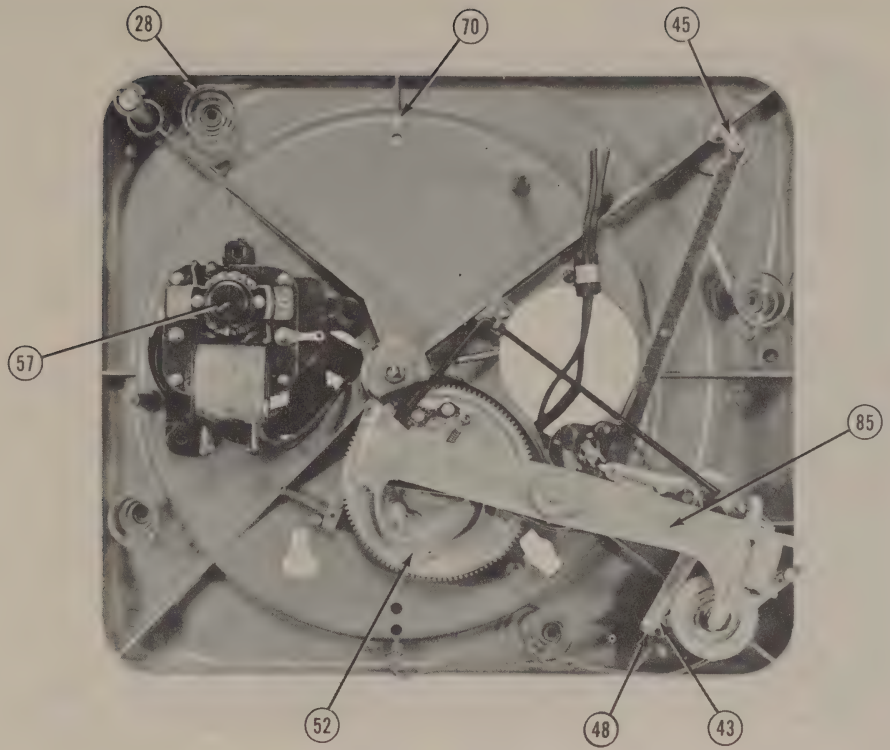
REJECTING: To reject a record at any time while it is playing, turn the control knob to "Rej." and release.

UNLOADING: To remove records from the turntable, lift up on the record support knob and swing the record support in either direction until the pin in shaft drops in the locating groove. Carefully lift the entire stack of records straight up.

CAUTION: When loading or unloading the changer, use care to prevent bending the spindle. Records should never be left on the offset portion of the spindle as they may warp.

STOPPING: To turn off the changer before the last record has been played, turn the control knob to "Off"; lift the pickup arm from the record and replace on rest.

MANUAL OPERATION: Odd-sized, warped records and home recordings should be played manually. Raise the record support clear of the spindle and swing the record support in either direction until the pin in the support shaft drops into the locating groove. Carefully place a record on the turntable. For a record to pass the step on the spindle, tilt the record toward the back of the pickup arm and work the record carefully over the step. Place the record support (2) over the spindle, permitting it to rest on the step of the spindle. Turn the control knob (26) to the "On" position. Press down on the index lever (19), which is located near the back of the pickup arm (7). Place the pickup arm on



BOTTOM VIEW FIG. 2

the edge of the record. Upon completion of the record, the pickup arm will return to a rest position on the rest post; that is, if the record has an eccentric cutoff groove. If the record does not have an eccentric groove, turn the control knob to "Rej." and release. The arm will then return to the pickup arm rest and shut off automatically. When playing "inside-out" records, press down on the index lever (19) and move the pickup arm all the way in to the spindle before setting it down on the first playing groove of the record.

REPEATING A SINGLE RECORD: Pull straight up on the support knob and swing the record support in either direction until the pin in the shaft drops into the locating groove. Remove any records remaining above the offset shoulder of the spindle. Do not replace the record support over the spindle. The changer will now repeat the top record on the turntable until the control knob is turned to the "off" position.

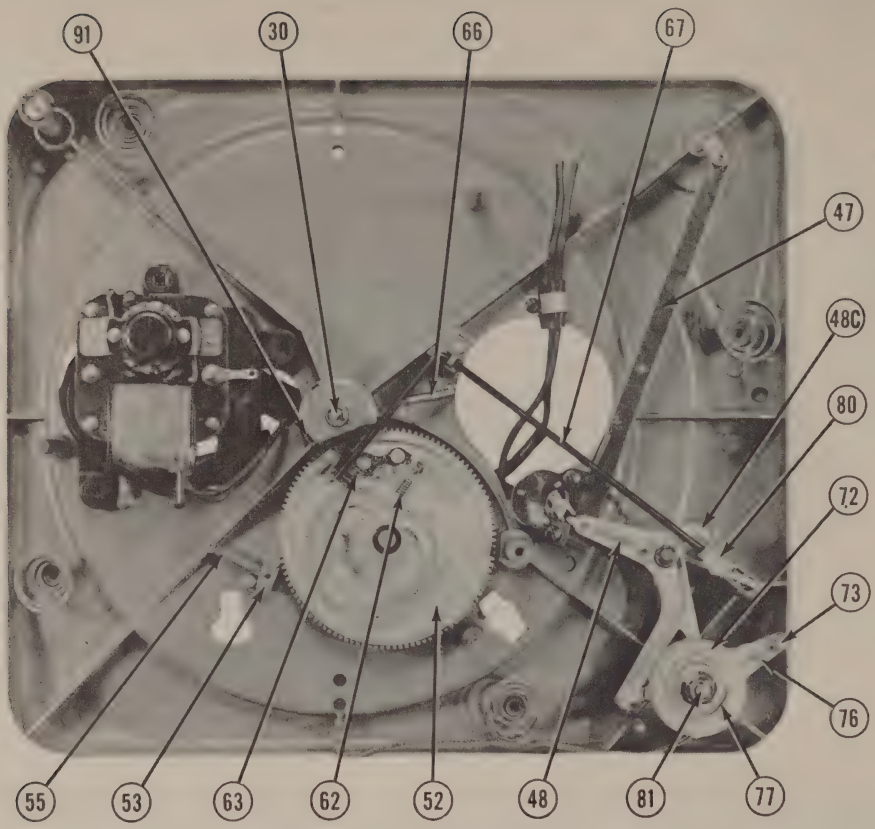
CHANGE CYCLE

(Refer to Figure 3 for the following reference numbers.) The change cycle is started by the oscillation of the pickup arm in the eccentric groove of the record. As the pickup arm moves across the record, the ratchet pawl (73) of the ratchet arm (72) slides along the serrated portion of the ratchet (80). At the end of the record, the oscillating action of the pickup arm in the eccentric groove caused the pawl (73) to straighten, pushing against the ratchet. This pivots the ratchet and trip rod (67), which as a result, releases the cam clutch pawl (63) and allows it to engage with the teeth of the turntable hub, shown in the exploded view, thus turning the cam gear (52) starting the change cycle.

As the main cam turns, the lift arm (85), shown in the exploded view, is actuated by the roller (90) riding in the heart-shaped groove on the bottom of the cam gear. One end of the lift arm controls the movement of the pickup arm, while the other end actuates the spindle assembly (3).

(Refer to the exploded view for the following reference numbers.) As the lift arm moves, the lift rod (81) rides up the cam surface (85A) of the lift arm (85) raising the pickup arm off the record. As soon as the pickup arm is fully raised, the cam surface (85B) contacts the boss extending down from the ratchet arm (72) swinging the pickup arm out to clear the records. As the pickup arm is swinging out, a projection on the set-down locator (43) snaps into a mating indentation in the ratchet arm (72) caused by the pressure of the lift arm spring (77) against the ratchet arm. When this occurs, the set-down locator turns with the ratchet arm. Inside the ratchet arm the safety spring (71) holds a casting on the bottom of the pickup arm locator assembly (46) against a stop surface inside the ratchet arm so that the two assemblies move together unless the pickup arm is held during the cycle. In this case, the safety spring allows the ratchet arm to move even though the pickup arm is held, thus preventing injury to the mechanism.

The pickup arm is moved out until a stop extending down from the hinge body (16) strikes a stop in the baseplate. The pickup arm is now clear of the records so that they are free to drop to the turntable. After the hinge body



BOTTOM VIEW LESS LIFT ARM FIG. 3

strikes the stop, preventing the pickup arm and hinge body from moving further, the lift arm (85) continues to turn the ratchet arm (72) a little farther around. By this movement, the ratchet arm turns the locator (43), which, in turn, turns the pickup arm locator (46), the hinge bearing (22), which is fastened to the pickup arm locator by the set screw (21), and the adjusting ring (14), which is fastened to the hinge bearing by the two set screws (11 and 12). This causes a gap between the end of one leg of the catch (17) and the catch surface extending from the adjusting ring. This allows the catch spring (20) to pull the leg on the catch (17) around until it hits the stop extending out at right angles to the outer step in the leg on the adjusting ring (14). In this position, the pickup arm will set down for 10-inch position. When a 12-inch record is dropped, the record hits the index lever (19), which, in turn, pivots the hinge cam (18) against the catch (17) moving it away from the outer step of the adjusting ring. The catch is held in this position by the step in the hinge cam which rests on the surface of the catch to prevent the catch from returning to its original position. The pickup arm is now set for 12-inch set down by the tension of the ring spring (10) which pulls against the hinge body (16).

At approximately the same time the cam surface (85B) contacts the boss of the ratchet arm, cam surface (85C) contacts the spindle roller (30). The roller now rides up the cam, actuating the spindle assembly (3), causing the record pusher (5) to move straight up so as to enter the center hole of the record, and then to be pivoted forward, thus dropping a record to the turntable.

The guide (4), which is held down by the spindle guide spring inside the spindle, prevents more than one record at a time from being ejected. When records are removed from the turntable, the guide slides straight up allowing free movement up the spindle.

The heart-shaped groove in the bottom of the cam now reverses the movement of the lift arm (85), returning the spindle assembly to its original position and swinging the pickup arm in, positioning it for set down and lowering it to the record. When the lift rod (81) is completely lowered, the tension of the lift rod spring (77) against the ratchet arm (72) is released. The ratchet arm will now drop down forming a gap between the indentation in the ratchet arm (72) and the projection on the locator (43). This allows the pickup arm to have free movement on the record.

(Refer to Figure 3 for the following reference numbers.)

The cam clutch pawl (63) of the main cam (52) now moves against the end of the trip rod (67) so as not to engage with the teeth of the turntable hub. The open section of the main cam is held, in respect to the turntable hub, by the engagement of the cam locator (53) with the two studs on the top side of the main cam, thus completing the change cycle.

(Refer to the exploded view for the following reference numbers.)

After the last record has been played, the record support

(2), which is flush with the offset shoulder on the spindle (3), engages the pusher (5) and keeps it from completing its full travel. This prevents the spindle pusher housing (29) from completely retracting as the roller (30) rides up the lift arm cam surface (85C). When the roller (30) reaches the top of the cam surface (85C), the cutoff rod (84) engages the shoulder of the spindle pusher housing (29). This causes the cutoff rod (84) to rotate 90°. As the lift arm (85) reverses its motion, the opposite end of the cutoff rod (84) engages the stud on the control lever (48), thus actuating the switch (51), and the knob (26) to the off position, through the control linkage (47). The tone arm (7) returns to the rest (25) as described in the preceding paragraphs. This completes the shutoff cycle of operation.

LUBRICATION

Additional lubrication should not be required for the life of the changer, but in cases of unusual use or high operating temperature, the changer should be lubricated as follows: (Refer to the exploded view).

Apply Lubriplate to:

1. Hinge bearing (22).
2. Ratchet arm (72) and set-down locator plate (43).
3. Cam faces on lift arm (85), lift arm bearing, and lift arm cut-off rod bearings.
4. Between lever spring (83) and cutoff rod (84).
5. Heart-shaped cam track on cam (52) and cam bearing.
6. Spindle between roller plunger (30) and roller spring housing (29), and between the roller spring housing and the spindle body.
7. Turntable ball bearing.

Apply a small quantity of light oil to:

1. Pickup arm locator assembly bearing (46) and ball bearing in pickup arm post.
2. Ratchet pawl (73) bearing.
3. Trip rod (67) bearings.
4. Control lever bearing (48).
5. Turntable and spindle bearing.

ADJUSTMENTS

PICKUP ARM SET DOWN: (Refer to the exploded view)

The set-down position of the stylus is adjusted by means of the two adjusting screws (11 and 12). If the stylus is setting down too far out on the record, loosen the back screw (11) about ¼ turn and tighten the front screw (12) to lock the adjustment in place. If the stylus is setting down too far in on the record, loosen the front screw and tighten the back screw.

PICKUP ARM HEIGHT: (Refer to the exploded view)

The pickup arm height is adjusted by the screw (13) located on top of the pickup arm lift rod (81). Turn the screw out or in until the underneath side of the pickup arm clears the rest by ⅛" to 3/16".

SERVICE INFORMATION

CONTROL KNOB CANNOT BE TURNED TO "ON" POSITION:

Machine shut off during cycle—

Turn the turntable clockwise by hand until the control knob is free.

TURNTABLE DOES NOT REVOLVE WHEN CONTROL KNOB IS TURNED TO "ON" POSITION:

1. Machine stalled in cycle:
   Turn the turntable clockwise by hand until it starts rotating under its own power.
2. No current at motor:
   (a) Check to determine if current is reaching A.C. leads of changer.
   (b) Check the switch to determine if it is closing.
   (c) Check wiring and soldered terminals in the changer.
3. Motor defective.
   Remove turntable to allow motor to operate without load. If current is reaching motor and pulley does not rotate, the motor is defective. Repair or replace.
4. Motor idler wheel not engaging turntable rim. If motor pulley is turning but turntable is not:
   (a) Check motor idler assembly to determine if it is free to contact the motor pulley and the turntable.
   (b) Wipe off the inside rim on the turntable to remove flock, or if oily, clean the turntable rim and rubber tire of the idler wheel (34) (shown in exploded view) with carbon tetrachloride.

CHANGER DOES NOT CYCLE WHEN THE CONTROL KNOB IS TURNED TO THE "REJ." POSITION: (Refer to Figure 3)

1. Manual reject not actuating the trip. Turn the control knob to the "Rej." position, hold, and see if the leg (48B) on the control lever (48) is contacting the stud on the ratchet (80) and turning the trip rod (67) sufficiently to allow the trip rod to disengage the clutch pawl (63).
2. Trip not actuating clutch:
   When the trip rod (67) is turned, and the clutch pawl (63) does not move forward, engaging the teeth of the turntable, check for a loose pawl spring (62) or binding between the clutch pawl and the cam. If binding occurs, clean out foreign matter and check for freedom, but do not oil.

RECORD DOES NOT DROP WHEN CHANGER CYCLES: (Refer to the exploded view)

1. Spindle pusher shaft broken:
   If the pusher shaft (inside the spindle) is broken, the roller assembly (30) will drop out of the spindle. Loosen the set screws (91) (Fig. 3) and remove the spindle assembly (3). Replace with a new spindle unit.
2. Pusher in spindle not moving far enough forward to eject a record. The pusher (5) should move up inside the spindle body, then move forward until it has reached a point flush with, or a maximum of, .010" beyond the spindle body. To assure that the pusher is all the way forward, the spindle roller (30) should be raised high enough by the lift arm (85) at the top of the cam face to slightly compress the roller spring inside the pusher housing (29). (See "Turntable Stalls During Cycle.") If the roller spring is compressed and the pusher (5) does not move far enough forward to eject a record, the spindle should be replaced. If a record is not pushed completely off the ledge, it may hang up on the spindle momentarily, then drop on the pickup arm when it moves in over the turntable.

A PHOTOFACT "EXPLODED" VIEW

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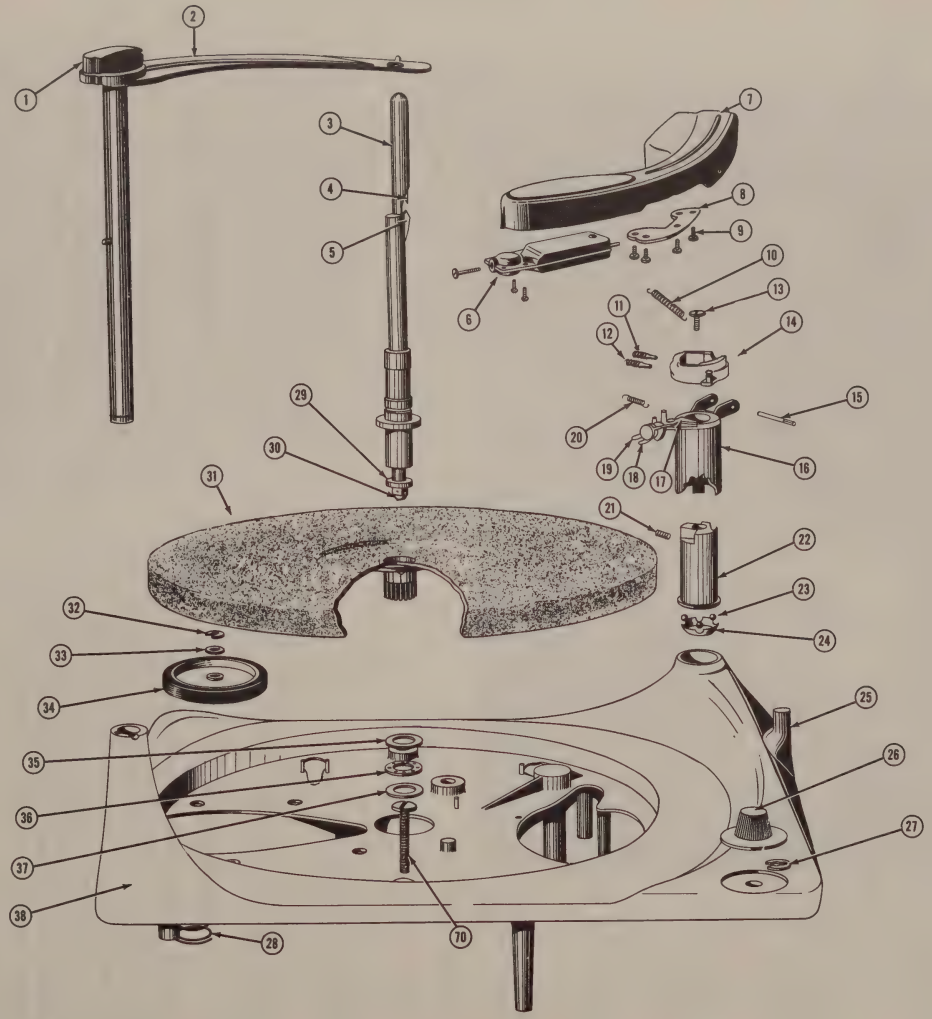
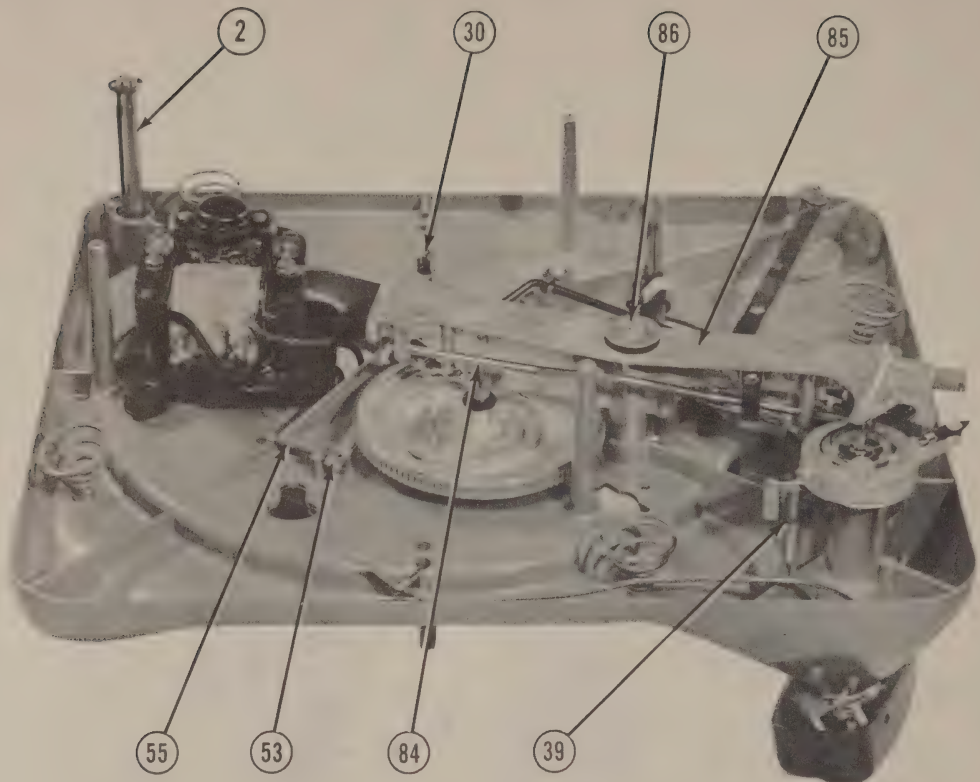


EXPLODED VIEW V-M MODEL 402



REAR VIEW FIG. 4

3. Lift Arm Screw Loose:
   Check screw (86) to determine if it is turned all the way in.

4. Pusher raises outside spindle body.
   When the changer cycles, the pusher (5) should first rise up inside the spindle body, then move forward inside the center hole in the record. If the pusher rises outside the spindle body, it will raise the record instead of pushing it off the spindle ledge. Remove the spindle and replace with a complete new spindle assembly.

5. Lift Arm Roller Broken Off.
   If the lift arm roller (90) is broken off, the lift arm (85) will not turn when the cam revolves.

TWO RECORDS DROP AT ONCE (Refer to the exploded view and Figure 1)

1. Hole in record too large.
   Check the diameter of the hole in the record. An oversize hole will cause two records to drop at once.

2. Spindle Slide Not Fully Down.
   If the spindle slide (4) is not all the way down, more than one record may be dropped at a time:
   (a) Check the slide to be sure it is free and does not bind at any point. Clean out foreign matter or straighten if necessary. Do not oil.
   (b) When records are placed on the spindle, be sure the slide is all the way down. The slide will normally raise slightly as a record is being dropped, but it should return to place immediately.

3. Record support binding on spindle or bent out of square with the shaft.
   The record support must be able to slide freely, by gravity, down the spindle. If the support does not follow the records down as they are being ejected, two or more records may be ejected at once. If binding occurs:
   (a) Check the spindle to determine if it is straight. Bend carefully with the fingers, if necessary.
   (b) Straighten the record support (2) if it is not square with the record support shaft.
   (c) If the hole in the record support is not centered over the spindle after checking (a) and (b), bend the support shaft post on the baseplate until the hole in the record support is centered over the spindle.
   (d) When the pin in the record support shaft has just entered the slot in the record support shaft post on the baseplate, the play in the record support as it is swung from one side to the other should be equal on both sides of the spindle. To correct bent condition, hold the support shaft and carefully force the record support into the proper position. If the support is loose on the shaft, remove the knob and restake with hammer and punch.

4. Record pusher defective:
   The record pusher (5) may be deformed, etc. This may cause two records to drop at once. Replace with new spindle assembly or pusher 5

RECORD HITS PICKUP ARM: (Refer to the exploded view)

1. Pusher in spindle not moving far enough forward to eject record. (See "Record Does Not Drop When Changer Cycles"—2)
2. Lift Arm screw loose:
   Tighten lift arm screw (86).
3. Pusher extending beyond outside diameter of spindle:
   Cycle changer by hand until roller assembly (3) is at the top of its travel. Using new record as a guage, pass it over spindle to see if it binds at any point. File off high points on pusher (5) with a fine file until record will pass freely over spindle.
4. Pickup arm not adjusted properly:
   The adjustment procedure for the stylus set-down point is given under "Adjustments." If the hinge bearing (22) has been removed or the hinge bearing set-screw (21) has been loosened, the relationship between the hinge bearing and the pickup arm locator assembly (46) must be reset. The procedure is as follows:
   Loosen the set-screw (21) sufficiently to allow the hinge bearing to slide on the pickup arm locator assembly shaft. The set-screw may be adjusted with an Allen wrench through the hole in the adjusting ring (14) located between the two adjusting screws (11 and 12). Place a 1/32" shim between the set-down locator (43) and the ratchet arm (72). Turn the control knob to the "Off" position. Raise the pickup arm and rotate the hinge assembly counterclockwise as far as it will go. In this position the arm extending from the set-down locator should be engaged by the turned-down leg on the control lever (48). Take up all the play between the parts by pressing up on the bottom of the ratchet arm and down on the top of the hinge bearing. Tighten the hinge body set-screw (21) and remove the shim.

STYLUS DOES NOT SET DOWN ON 10" RECORD IN PROPER POSITION: (Refer to the exploded view)

1. Pickup arm not adjusted properly. (See "Record Hits Pickup Arm"—4.)
2. Hinge catch (17) does not return to 10" record position when changer cycles:
   (a) Stop the machine in mid-cycle when the lift arm (85) has moved as far out as it will go and is about to move back to its starting position. Lift the pickup arm and see if there is a gap of at least 1/64" between the end of the leg on the catch (17) and outside step on the adjusting ring (14). The catch should be free to allow it to be pulled forward against the stop at the end of the leg on the adjusting ring. If there is not enough gap, check the setting of the hinge body and the pickup arm locator (see "Record Hits Pickup Arm"—4). If the setting is incorrect, the cam face on the lift arm (85), which contacts the round stud on the bottom of the ratchet arm (72), may be bent. The ratchet arm should be forced around far enough to bring the pickup arm out until the stop on the bottom of the hinge casting meets the stop in the baseplate; then, to assure that the pickup arm is out as far as it will go, the lift arm should move the ratchet arm a few degrees farther around, which will slightly compress the safety spring (71) and hold the pickup arm out firmly against the stop.
   (b) Lubricate the hinge bearing with lubriplate. Do not use heavy grease. If the bearing between the hinge bearing and hinge body binds, the safety spring will compress instead of bringing the hinge body around firmly against the stop.
3. (a) Binding between safety spring and ratchet arm: If the safety spring (71) binds against the ratchet arm and does not hold the casting on the bottom of the pickup arm locator assembly (46) against the stop inside the ratchet arm, irregular stylus set-down will result. Disassemble the pickup arm locator assembly (46) by removing the lift arm (85), loosening the hinge bearing set-screw (21), and pull the ratchet arm and pickup arm locator assemblies down from the bottom of the changer. Hold the pickup arm locator shaft in one hand, turn the ratchet arm assembly to slightly compress the safety spring, release, and see if the safety spring returns the pickup locator casting firmly against the stop surface in the ratchet arm assembly. If binding occurs, remove the safety spring to see if the pickup arm locator casting turns freely in the ratchet arm casting. Remove burrs or sharp edge on end of safety spring, stretch safety spring a little to increase tension and replace.
   (b) Check to see if the locator plate (43) is meshing with the ratchet arm (72) when the lift rod (81) is positioned at the beginning of the sloping cam surface (85A) of the lift arm (85) in the final stage of the cycle.
   To test the meshing of the locator plate and the ratchet arm, swing the tone arm half way in toward the spindle. If the locator plate and the ratchet arm disengage when in the above position, it is necessary to reset the clearance between the locator plate and the ratchet arm. Also it may be necessary to file off any burrs which may be present on the mating surfaces of the locator plate and the ratchet arm.
4. Hinge catch does not disengage from the hinge cam:
   When the index lever (19) has been depressed, it is held in the position until the catch (17) is disengaged. (See "Stylus Does Not Set Down On 12" Record In Proper Position"—6.) When the cycle is completed, if the catch does not disengage from the hinge cam (18):
   (a) Check to determine if the leg on the catch (17) is sliding down the incline on the leg of the adjusting ring (14). (See "Stylus Does Not Set Down on 12" Record in Proper Position"—6.)
   (b) The catch (17) and the hinge cam (18) are not disengaging when the catch leg is resting on the inside step on the adjusting ring. If this occurs, file the edge of the catch which contacts the hinge cam until the two parts have a clearance between them of about 1/64" when the leg on the catch is on the inside step on the adjusting ring.

STYLUS DOES NOT SET DOWN ON 12" RECORD IN PROPER POSITION: (Refer to the exploded view)

1. Diameter of 12" record undersize:
   The set-down position of the stylus for 12" records is

A PHOTOFACT "EXPLODED" VIEW

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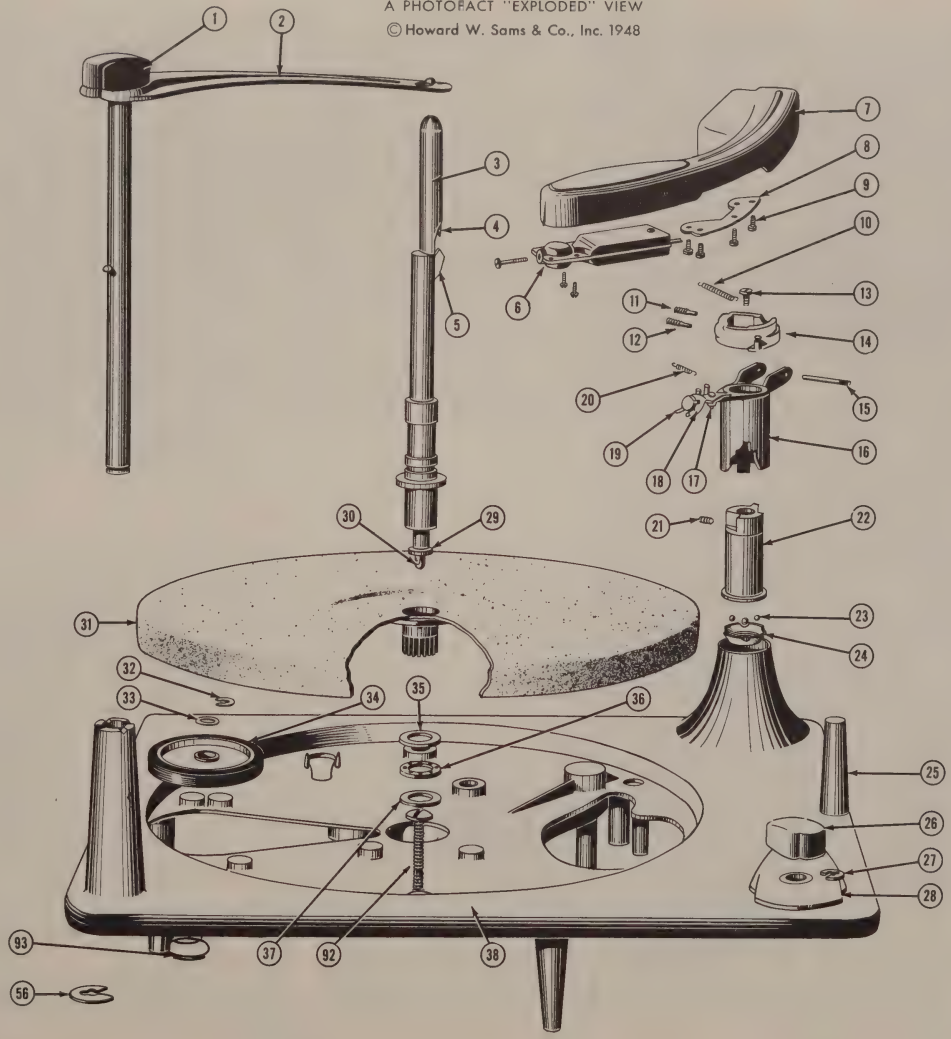

EXPLODED VIEW V-M MODEL 400-C

determined by the edge of the record striking the index lever (19). If a 12" record has a diameter of less than the standard size of 11⅞", plus or minus 1/32", it may fail to depress the trip lever far enough.

2. Enlarged center hole in record:
   An enlarged center hole might fail to set the index lever because it could produce the same effect as a small record.

3. Pickup arm not adjusted properly. (See "Record Hits Pickup Arm"—4.)

4. Binding between safety spring and ratchet arm. (See "Stylus Does Not Set Down on 10" Record in Proper Position"—3.)

5. Index lever does not cock when 12" record drops:
   Allows a 12" record to drop to the turntable and stop the changer just after it falls, before the pickup arm has a chance to move in over the record. The index lever (19) should be forced down until the step on the hinge cam (18) passes the edge of the catch (17), preventing the hinge cam and the index lever from returning to their original position. If the index lever does not stay down in a depressed position:
   (a) Check the catch (17) to see if it is free to move forward and engage the hinge cam.
   (b) If the stop on the hinge body (16) is defective, it might allow the pickup arm to move too far out, thus moving the index lever away from the spindle. This would produce the same effect as an undersize record.

6. Hinge catch does not go into inside step on adjusting ring when index lever is depressed:
   When the index lever (19) is tripped by a falling 12" record, the leg on the catch (17) should be moved out over the incline between the inside and outside steps on the adjusting ring leg and held in that position by the shoulder on the hinge cam (18) until the pickup arm starts to move in over the record. When this occurs, the leg on the catch should contact the incline and be moved out as it slides down the incline until the catch is disengaged and the index lever can snap back up to a horizontal position. If the leg on the catch is not moved out far enough to enable it to slide down the incline, file about a 1/64" chamfer on the edge of the catch leg which contacts the incline.
   Check for binding between hinge body (16) and hinge bearing (22). Burrs on the bearing surfaces or lack of lubrication may prevent the hinge bearing from turning freely.

STYLUS DOES NOT TRACK ACROSS RECORD PROPERLY

1. Stylus may be clogged by accumulation of lint, dirt, etc.

2. Ratchet arm does not disengage from the set-down locator when a cycle is completed.
   (a) There should be a 1/32" gap between the ratchet arm and the set-down locator when the machine is not in a cycle.
   If the gap is small enough to allow the parts to touch and bind as the needle moves across the record, the hinge bearing must be reset. (See "Record Hits Pickup Arm"—4.)

3. Hinge bearing binds.
   Place a block under the back end of the pickup arm to prevent the needle from touching the turntable. With sensitive gram scale, check the amount of force required to move the pickup arm across the turntable. The force required should not exceed 2 grams. If the pressure required is excessive:
   (a) Check the ratchet arm and set-down locator for binding. (See 2 above)
   (b) Check the bearing in the pickup arm post for binding.
   The bearing is located below the hinge bearing (22). To inspect it, loosen the set-screw (21) in the hinge bearing. Unsolder the pickup leads and pull them out. Pull up on the hinge and pickup assemblies. Clean foreign matter or corrosion from the bearings; lubricate with light oil. (To reset position, see "Record Hits Pickup Arm"—4.)

CHANGER TRIPS BEFORE STYLUS REACHES END OF RECORD: (Refer to Figure 3)

1. Hole in record too large.
   If hole in record is too large, the groove may turn eccentric with the spindle and cause premature tripping.

2. Insufficient tension on trip spring.
   The trip spring (66) should have enough tension to pull the trip rod back to a fully engaged position if an eccentric record is being played.

3. Binding in trip rod bearings.
   With the trip released, check the trip rod for play in the bearings. It should be free to turn without binding.

CHANGER DOES NOT CYCLE WHEN RECORD HAS BEEN PLAYED: (Refer to Figure 3)

1. Binding in trip rod bearings. (See "Changer Trips Before Stylus Reaches End of Record"—3.)

2. No eccentric trip groove on record:
   All standard records made today have an eccentric trip groove, but some records made in the past did not have this groove. When records of this type are being played, the control knob must be turned to "Rej." at the end of the record.

3. Ratchet pawl not engaging the ratchet sector:
   The ratchet pawl (73) must press against the ratchet sector forcing it back when the motion of the pickup arm is reversed. If the pawl does not contact the ratchet sector or slides over it:
   (a) Check the pawl (73) for burrs around the hole.
   (b) Be sure the pawl is free to turn on the bearing. If the drive pin is driven down too far causing binding, the pin may be relieved by tapping up on the shank.
   (c) Check the pawl spring (76) for insufficient tension.
   (d) Check the point on the pawl. It should be sharp to enable it to dig into the ratchet teeth. Sharpen with stone if necessary.

4. Ratchet sector too far away from ratchet pawl.
   If the ratchet sector (80) is too far away from the pawl (73), the eccentric motion required to operate the trip will be excessive. If necessary, bend the trip bracket in slightly to reduce this distance. If the sector is too close to the pawl, excessive trip pressure will result.

5. Stylus Jumps Out Of Eccentric Groove In Record.
   (a) Check trip pressure—should not exceed 8 grams.

(If the pressure is excessive, see paragraph 4 immediately preceding.)

(b) The record may be defective. The trip groove is often too shallow. Check with a record which is known to be good.

(c) The jewel point may be damaged or affected by an excessive accumulation of dust, lint, etc.

(d) There may be binding in the pickup bearing or ratchet arm. (See 2 and 3 "Stylus Does Not Track Across Record Properly.")

6. Clutch Pawl Binding On Cam Face.
The clutch pawl (63) must be free to move forward and engage the teeth of the turntable hub when the trip rod releases it. Check for burrs or foreign matter lodged between the pawl and the cam. Do not oil as this might collect dirt and gum up the pawl.

PICKUP ARM STRIKES RECORDS ON SPINDLE WHEN IT RAISES OR PICKUP ARM REST WHEN IT MOVES OUT

Pickup arm height not adjusted properly. (See instructions for adjusting the pickup arm height under "Adjustments.")

TURNTABLE SPEED TOO SLOW: (Refer to the exploded view)

1. Binding in turntable bearing.
Check the turntable bearing for freedom. Hold the motor idler wheel (34) out of engagement with the turntable and spin the turntable by hand to see if it turns readily and coasts for a long time. If binding occurs, remove turntable, foreign matter, and lubricate with light oil.
2. Motor pulley too small in diameter. Replace the motor pulley with one having a greater diameter.
3. Line voltage too low. The line voltage should not be less than 100 volts or the turntable may be too slow.
4. Operating temperature too low. If the machine has been stored in a cold place or operated in surroundings at a temperature of less than 60° F., the turntable speed may be too slow.

TURNTABLE SPEED TQO FAST

Motor pulley too large in diameter. Replace the pulley with one having a smaller diameter or grind one or two thousandths off the pulley.

TURNTABLE STALLS DURING CYCLE: (Refer to the exploded view)

1. Motor idler not engaging turntable. (See "Turntable Does Not Revolve When Control Knob Is Turned To 'On' Position"—4.)
2. Turntable bearing tight. (See "Turntable Speed Too Slow"—1.)
3. Operating temperature too low. (See "Turntable Speed Too Slow"—4.)
4. Line voltage too low.
The line voltage should not be less than 100 volts.
5. Binding in drive mechanism:
   (a) Remove lift arm (85) and hold idler (34) away from turntable or remove idler wheel. Cycle machine, turning turntable slowly by hand. The cam should turn freely for the complete revolution without binding at any point. If binding occurs, check for foreign matter in the gear teeth, a bent cam bearing or bent spindle bushing.
   (b) Replace lift arm, loosen spindle screw (91) and raise spindle high enough to clear the lift arm cam when the machine cycles. Hold the pickup arm lift rod (81) up so the end of the lift rod does not contact the lift arm cam. Cycle the machine by hand. The entire cycle should be free, without binding at any point. If binding occurs, check the lift arm bearing for freedom and the lift arm roller to be sure it is not bent causing binding in the cam track.
6. Binding between pickup arm lift rod and lift arm cam face. Cycle machine stopping it half way through the cycle just as the lift arm is about to return. Lift pickup arm and raise lift rod (81) by pulling up on the adjusting screw (13) as high as it will go. Feel the lift arm (85) for play. The lift rod may still touch the lift arm cam face, but it should not bind. If binding occurs, the lift arm bearing may be bent or the fibre washer (89) under the lift arm should be removed to lower the lift arm.
7. Spindle roller spring compressed too far. Cycle the changer and watch the relationship between the bottom of the pusher housing (29) and the roller (30). Just before the top of the lift arm cam raise is reached, the pusher housing should stop its upward motion and the roller should continue up .005" to .047" more, slightly compressing the roller spring. If the spring compresses too much, the changer may stall on the shut-off cycle. Check the lift arm bearing to determine if it is square with the baseplate. It should be 90° to the baseplate within ¼°. If it is bent, carefully pound into place with a soft mallet. If it is straight and the roller spring is being compressed too much, remove the fibre washer (89) between the lift arm and the steel washer under it. The dimension on the spindle between the shoulder on which it rests and the bottom of the roller should be 1⅞" plus or minus .010. An oversize spindle could also cause a binding condition.
8. Motor weak. In cases where everything checks all right but the changer still stalls in cycle, the motor may be weak.

CHANGER CONTINUES TO CYCLE: (Refer to Figure 3)

1. Trip rod not holding clutch pawl out of engagement with the teeth on the turntable hub. The end of the trip rod (67) should contact the bent up section of the clutch pawl (63) and push the pawl out of engagement with the teeth on the turntable hub. If the trip rod is not free to meet the clutch pawl, continuous cycling will result:
   (a) See if trip spring (66) is in place.
   (b) Insufficient tension on the trip spring (66).
   (c) Check the trip rod (67) for freedom in its bearings.
2. Defective clutch pawl (63).
3. Reject control holding trip open. Check the control knob (26), control link (47), and control lever (48) for binding to determine if the control assembly is holding the trip rod in a disengaged position with the clutch pawl.

NOISE DURING PLAYING OF RECORD

1. Rumble:
   (a) From motor: If a low-pitched rumbling sound comes from the loud speaker while a record is being played, check the motor grommets (58) (exploded view) to be sure the motor is freely suspended on them. The motor lead wires should have

slack to allow the motor to float. Motor rumble may also come from an out-of-balance motor rotor. In this case, the motor should be replaced.

(b) From bearings: Defective turntable bearings can cause rumble. Check for foreign matter in the bearing, defective balls, binding between balls and ball retainer; rough surface on washers. Clean ball bearing, sleeve bearing and washers; lubricate with lubriplate or light oil

2. Defective motor idler wheel:
A rapid thumping sound while the motor is running may indicate a flat spot on the motor idler wheel (34) (exploded view). If this condition does not clear up after ten minutes of run-in time remove the turntable and check the rubber tire on the idler. If the surface of the rubber tire is not smooth and even, replace the idler.

3. Defective record:
Worn or defective records cause stylus scratch and distortion of the recorded sound. If the record is warped it may slip on the other records causing "wow," a waver in the recorded sound. An enlarged hole in the record can also cause "wow."

4. Turntable Scrapes:
If a scraping sound occurs as the turntable revolves, check:
   (a) Turntable warped, causing outer rim to rise and fall.
   (b) Motor idler or mounting plate bent.
   (c) Wires beneath turntable rubbing.

5. Squeaks:
Squeaking sound as changer operates indicates lack of oil. Lubricate points indicated under "Lubrication."

DISTORTION OF RECORDED SOUND

1. Defective record. (See 3—"Noise During Playing of Record.")
2. Defective amplifier.
Check phonograph amplifier and speaker.
3. Bad cartridge.

NO SOUND DURING PLAYING

1. Defective cartridge.
2. Defective wiring.
Check pickup leads for a shorted or open lead.
3. Defective amplifier.

EXCESSIVE RECORD WEAR

1. Binding in pickup arm. (See 2 and 3—"Stylus Does Not Track Across Record Properly.")

CHANGER DOES NOT SHUT OFF AFTER LAST RECORD HAS BEEN PLAYED: (Refer to the exploded view and figure 4)

1. Record support binding on spindle.
The record support (2) must rest on the off-set shoulder of the spindle or the changer will not shut off. (See 3—"Two Records Drop At Once.")
2. Cut-off rod (84) not engaging shoulder on spindle pusher housing (29).
On the shut-off cycle, the end of cut-off rod (84) should contact the shoulder on the bottom of the spindle pusher housing (29) and turn the cut-off rod over 90°. If the end of the cut-off rod passes under the pusher housing as the machine cycles on the shut-off cycle, check:
   (a) The record support to be sure it is resting on the spindle; see 1, above.
   (b) The spindle to see if it is being held in place by the spindle set screws (91).
   (c) The lift arm screw (86) to be sure it is tight.
   (d) The bent-up end of the cut-off rod (84) may be short. Replace if ncessary.

PICKUP ARM DOES NO SET DOWN ON REST AFTER LAST RECORD HAS BEEN PLAYED: (Refer to figure 2)

Control lever does not engage set-down locater.

On the shut-off cycle, the leg of the control lever (48) should catch the set-down locator (43) holding it to prevent the return spring (39) from pulling the pickup arm in. The pickup arm should be held against the stop in the baseplate. In this position, the nest in the pickup arm should be directly above the pickup rest.

CHANGER SHUTS OFF PREMATURELY: (Refer to the exploded view)

1. Spindle roller spring compressed too far. (See 7—"Turntable Stalls During Cycle.")
2. Roller spring in spindle too weak.
When the bottom record of a stack of ten 12" records is being ejected from the spindle ledge, the roller spring (in the housing) should not compress until just before the roller reaches the top of the cam incline on the lift arm. If the roller spring is compressed under the load of a full stack of records, it may cause premature shut off. Replace with a complete spindle assembly (3).
3. Record too thick.
The changer is designed to play standard records. If an old-style ⅛" thick record is used, the changer will shut off instead of dropping the record.
4. Cut-off rod not being reset.
After the shut-off cycle, when the cut-off rod (84) has been turned to throw the switch to the "Off" position, should be returned to its original position the next time the machine cycles by the bent-up end of the cut-off rod, contacting the round stud on one leg of the control lever (48). The flat spring (83) acting against the cut-off rod should throw the rod against its stop on the lift arm (85) and hold it there. If the cut-off rod is not fully turned, the bent-up end next to the spindle may stick up high enough to prematurely contact the shoulder on the pusher housing (29):
   (a) Check the lever spring (83) for tension. Remove and bend slightly to increase tension if necessary.
   (b) Lubricate the cut-off rod bearings and around the lever spring with lubriplate or oil.
   (c) Check the clearance between the end of the cut-off rod (84), which passes under the control lever (48), and the bottom of the round stud on the control lever. When the cut-off rod is in its normal operating position, it should not clear the bottom of the round stud by more than enough to completely turn the end of the cut-off rod from vertical position back to a horizontal position.

TURNTABLE CONTINUES TO ROTATE WHEN CONTROL KNOB IS TURNED TO "OFF" POSITION.

Switch defective.

Check switch for defects and replace if necessary.

PARTS LIST FOR V-M 402

Ref. No.	Part No.	PART NAME
1	1711	Record Support Assembly Knob (Part of Item 2)
2	2109	Record Support Assembly (Including Item 1)
3	1566	Spindle Assembly Consists Of:
		1552 Record Pusher
		1535 Pin-Spindle Roller
		1536 Spindle Roller
		1557 Spindle Pusher Shaft
		1559 Pusher Pin
		1560 Pusher Shaft Spring
		1561 Roller Spring Housing
		1562 Roller Spring
		1564 Groove Pin
		1565 Roller Plunger
		1687 Spring Guide
4	1687	Spring Guide (Part of Item 3)
5	1552	Record Pusher (Part of Item 3)
6	649-E	Cartridge (Shure P-93) or (Astatic L-70)
7	2030-B	Pickup Arm Only
8	2031	Pickup Arm Strengthener
9		Mounting Screw for Strengthener
10	1574	Spring for Adjusting Ring
11	1580	Adjusting Screw (Part of Item 14)
12	1580	Adjusting Screw (Part of Item 14)
13	1616-B	Height Adjusting Screw (Part of Item 81)
14	1840	Adjusting Ring Assembly—Consists of:
		1574 Spring
		1577 Adjusting Ring
		1580 Adjusting Screw
15	941-B	Hinge Pin
16	2043	Hinge Assembly—Consists of:
		1512 Hinge Bearing Assembly
		1547 Drive Pin
		1575 Spring Index Cam
		1578 Catch
		1579 Drive Pin
		1581 Index Cam
		1582 Index Lever
		1583 Spring Catch
		1621 Spring Lever Return
		1840 Adjusting Ring Assembly
		1846 Washer Selector
		2042 Hinge Body
17	1578	Catch (Part of Item 16)
18	1581	Index Cam (Part of Item 16)
19	1582	Index Lever (Part of Item 16)
20	1583	Catch Spring (Part of Item 16)
21	1610	Set Screw (Part of Item 22)
22	1512	Hinge Bearing Assembly—Consists of:
		1609 Hinge Bearing
		1610 Set Screw
		1611 Bearing Cone
23	724	Ball Bearing for Pickup Arm Assembly
24	1614	Bearing Spacer for Hinge Body Assembly
25		Pickup Arm Rest (Part of Item 38)
26	2054-B	Control Knob
27	1719	"C" Washer for Control Crank
28	1724	Mounting Spring
29	1561	Roller Spring Housing (Part of Item 3)
30	1536	Spindle Roller (Part of Item 3)
	1565	Roller Plunger (Part of Item 3)
31	1505-A	Turntable Assembly
32		"C" Washer for Idler Wheel
33		Fiber Washer for Idler Wheel
34	482	G.I. Idler Wheel Idler Wheel used with G.I. Motor, which is identified by a letter "G" stamped on plate, or "G.I." stamped on bottom bearing.
	1515	Russell Idler Wheel Idler Wheel used with Russell Motor, which is identified by a letter "R" stamped on plate and absence of identifying mark on lower bearing.
35	1568	Turntable Washer
36	1569	Turntable Bearing
37	1568	Turntable Washer
38		Base Plate
39	1631	Locator Spring
40	1654	Fiber Washer
41	1639	Fiber Washer
42	1652	"C" Washer
43	1630	Set-Down Locator Plate
44	1542	"C" Washer for Set-Down Locator
45	1726	Control Crank (Part of Item 48)
46	1522	Pickup Arm Locator Assembly—Consists of:
		1612 Pickup Shaft
		1634 Pickup Locator
47	1725	Control Link (Part of Item 48)
48	1706	Control Lever Assembly—Consists of:
		1635 Control Lever
		1725 Control Link
		1726 Control Crank
		1727 Rivet
49	1721	Reject Spring
50	709-A	Screw No. 6 x 1/4" Type "Z"
51	1519	A.C. Switch Assembly—Consists of:
		1629 Switch Plate
		467 Switch
52	1510	Cam Assembly—Consists of:
		1607 Cam
		1547 Drive Pin
		1697 Spring
		1918 Cam Pawl
		1920 Cam Stud Sleeving
53	1919	Cam Locator
54		Drive Pin
55	419	Cam Locator Spring
56	2110	"C" Washer for Record Support Arm
57	1525	110-Volt, 60-Cycle Russell Motor
	1911	110-Volt, 60-Cycle G.I. Motor
58		Motor Mounting Grommet
59	1685	Motor Fastener
60	1685	Motor Fastener
61		Screw for Trip Rod
62	1697	Spring (Part of Item 52)
63	1918	Cam Pawl (Part of Item 52)
64	1547	Drive Pin
65	1653	Fiber Washer
66	133	Trip Spring
67	1534	Trip Rod and Ratchet Assembly—Consists of:
		1585 Trip Rod
		1590 Ratchet
68	1650	"C" Washer
69	1651	"C" Washer for Main Cam
70		Trip Rod Bearing
71	1638	Safety Spring for Pickup Arm and Hinge Assembly
72	1511	Ratchet Arm Assembly—Consists of:
		540 Washer
		1547 Drive Pin
		1605 Ratchet Arm
		1606 Ratchet Pawl
		1697 Pawl Spring
73	1606	Ratchet Pawl (Part of Item 72)
74	1729	Trip Rod Bearing
75	709-A	Screw No. 6 x 1/4 Type "Z"
76	1697	Pawl Spring (Part of Item 72)
77	1620	Spring for Lift Rod
78	1588	"C" Washer
79	1589	Fiber Washer
80	1590	Ratchet (Part of Item 67)
81	1513	Lift Rod Assembly—Consists of:
		1613 Lift Rod
		1616-B Screw
82	1652	"C" Washer for Lift Rod
83	1599	Spring for Cut-Off Rod
84	1595	Cut-Off Rod
85	1509	Lift Arm Assembly—Consists of:
		68 Roller Drive Pin
		1594 Lift Arm
		1595 Cut-Off Rod
		1596 Pin
		1597 Roller
		1599 Spring Lever
		1916 Screw
86	277	Screw No. 8-32 x 3/8"
87		Lockwasher
88	1636	Lift Arm Washer
89	1637	Fiber Washer 1/64" Thick
	1922	Fiber Washer 3/64" Thick
90	1597	Roller (Part of Item 85)
91		Spindle Mounting Screws

PARTS LIST FOR V-M 400-C

Ref. No.	Part No.	PART NAME	List Price
1	1711	Record Support Assembly Knob (Part of Item 2)	
2	2109	Record Support Assembly (Including Item 1)	
3	1566	Spindle Assembly Consists Of:	
		1552 Record Pusher	
		1535 Pin-Spindle Roller	
		1536 Spindle Roller	
		1557 Spindle Pusher Shaft	
		1559 Pusher Pin	
		1560 Pusher Shaft Spring	
		1561 Roller Spring Housing	
		1562 Roller Spring	
		1564 Groove Pin	
		1565 Roller Plunger	
		1687 Spring Guide	
4	1687	Spring Guide (Part of Item 3)	
5	1552	Record Pusher (Part of Item 3)	
6	649-E	Cartridge (Shure P-93) or (Astatic L-70)	
7	2030-B	Pickup Arm Only	
8	2031	Pickup Arm Strengthener	
9		Mounting Screw for Strengthener	
10	1574	Spring for Adjusting Ring	
11	1580	Adjusting Screw (Part of Item 14)	
12	1580	Adjusting Screw (Part of Item 14)	
13	1616-B	Height Adjusting Screw (Part of Item 81)	
14	1840	Adjusting Ring Assembly—Consists of:	
		1574 Spring	
		1577 Adjusting Ring	
		1580 Adjusting Screw	
15	941-B	Hinge Pin	
16	2043	Hinge Assembly—Consists of:	
		1512 Hinge Bearing Assembly	
		1547 Drive Pin	
		1575 Spring Index Cam	
		1578 Catch	
		1579 Drive Pin	
		1581 Index Cam	
		1582 Index Lever	
		1583 Spring Catch	
		1621 Spring Lever Return	
		1840 Adjusting Ring Assembly	
		1846 Washer Selector	
		2042 Hinge Body	
17	1578	Catch (Part of Item 16)	
18	1581	Index Cam (Part of Item 16)	
19	1582	Index Lever (Part of Item 16)	
20	1583	Catch Spring (Part of Item 16)	
21	1610	Set Screw (Part of Item 22)	
22	1512	Hinge Bearing Assembly—Consists of:	
		1609 Hinge Bearing	
		1610 Set Screw	
		1611 Bearing Cone	
23	724	Ball Bearing for Pickup Arm Assembly	
24	1614	Bearing Spacer for Hinge Body Assembly	
25		Pickup Arm Rest (Part of Item 38)	
26	1711	Control Knob	
27	1719	"C" Washer for Control Crank	
28	963-2B	Escutcheon for Control Knob	
29	1561	Roller Spring Housing (Part of Item 3)	
30	1536	Spindle Roller (Part of Item 3)	
	1565	Roller Plunger (Part of Item 3)	
31	1505-A	Turntable Assembly	
32		"C" Washer for Idler Wheel	
33		Fiber Washer for Idler Wheel	
34	482	G.I. Idler Wheel Idler Wheel used with G.I. Motor, which is identified by a letter "G" stamped on plate, or "G.I." stamped on bottom bearing.	
	1515	Russell Idler Wheel Idler Wheel used with Russell Motor, which is identified by a letter "R" stamped on plate and absence of identifying mark on lower bearing.	
35	1568	Turntable Washer	
36	1569	Turntable Bearing	
37	1568	Turntable Washer	
38		Base Plate	
39	1631	Locator Spring	
40	1654	Fiber Washer	
41	1639	Fiber Washer	
42	1652	"C" Washer	
43	1630	Set-Down Locator Plate	
44	1542	"C" Washer for Set-Down Locator	
45	1726	Control Crank (Part of Item 48)	
46	1522	Pickup Arm Locator Assembly—Consists of:	
		1612 Pickup Shaft	
		1634 Pickup Locator	
47	1725	Control Link (Part of Item 48)	
48	1706	Control Lever Assembly—Consists of:	
		1635 Control Lever	
		1725 Control Link	
		1726 Control Crank	
		1727 Rivet	
49	1721	Reject Spring	
50	709-A	Screw No. 6 x 1/4" Type "Z"	
51	1519	A.C. Switch Assembly—Consists of:	
		1629 Switch Plate	
		467 Switch	
52	1510	Cam Assembly—Consists of:	
		1607 Cam	
		1547 Drive Pin	
		1697 Spring	
		1918 Cam Pawl	
		1920 Cam Stud Sleeving	
53	1919	Cam Locator	
54		Drive Pin	
55	419	Cam Locator Spring	
56	2110	"C" Washer for Record Support Arm	
57	1525	110-Volt, 60-Cycle Russell Motor	
	1911	110-Volt, 60-Cycle G.I. Motor	
58		Motor Mounting Grommet	
59		Grommet Spacer	
60	1854	Washer	
61	1717	Screw No. 6 x 5/8 Type "Z"	
62	1697	Spring (Part of Item 52)	
63	1918	Cam Pawl (Part of Item 52)	
64	1653	Fiber Washer	
65	1651	"C" Washer for Main Cam	
66	133	Trip Spring	
67	1534	Trip Rod and Ratchet Assembly—Consists of:	
		1585 Trip Rod	
		1590 Ratchet	
68	1650	"C" Washer	
69		Bearing Mounting Screw	
70	1591	Trip Rod Bearing	
71	1638	Safety Spring for Pickup Arm and Hinge Assembly	
72	1511	Ratchet Arm Assembly—Consists of:	
		540 Washer	
		1547 Drive Pin	
		1605 Ratchet Arm	
		1606 Ratchet Pawl	
		1697 Pawl Spring	
73	1606	Ratchet Pawl (Part of Item 72)	
74	1729	Trip Rod Bearing	
75	709-A	Screw No. 6 x 1/4 Type "Z"	
76	1697	Pawl Spring (Part of Item 72)	
77	1620	Spring for Lift Rod	
78	1588	"C" Washer	
79	1589	Fiber Washer	
80	1590	Ratchet (Part of Item 67)	
81	1513	Lift Rod Assembly—Consists of:	
		1613 Lift Rod	
		1616-B Screw	
82	1652	"C" Washer for Lift Rod	
83	1599	Spring for Cut-Off Rod	
84	1595	Cut-Off Rod	
85	1509	Lift Arm Assembly—Consists of:	
		68 Roller Drive Pin	
		1594 Lift Arm	
		1595 Cut-Off Rod	
		1596 Pin	
		1597 Roller	
		1599 Spring Lever	
		1916 Screw	
86	277	Screw No. 8-32 x 3/8"	
87		Lockwasher	
88	1636	Lift Arm Washer	
89	1637	Fiber Washer 1/64" Thick	
	1922	Fiber Washer 3/64" Thick	
90	1597	Roller (Part of Item 85)	
91		Spindle Mounting Screws	
92		Shipping Bolt	
93	1724	Mounting Spring	

TOP VIEW

GENERAL INFORMATION

This changer is designed for use with the 33⅓ RPM Microgroove records. If desired, up to twelve 10-inch or ten 12-inch Microgroove records may be played at one loading. Power supply is 110-volt, 50-60-cycle current only. A special drive sleeve is available for 50-cycle operation.

Manufacturer: **WEBSTER-CHICAGO CORPORATION**

5610 Bloomingdale Avenue • Chicago 39, Illinois

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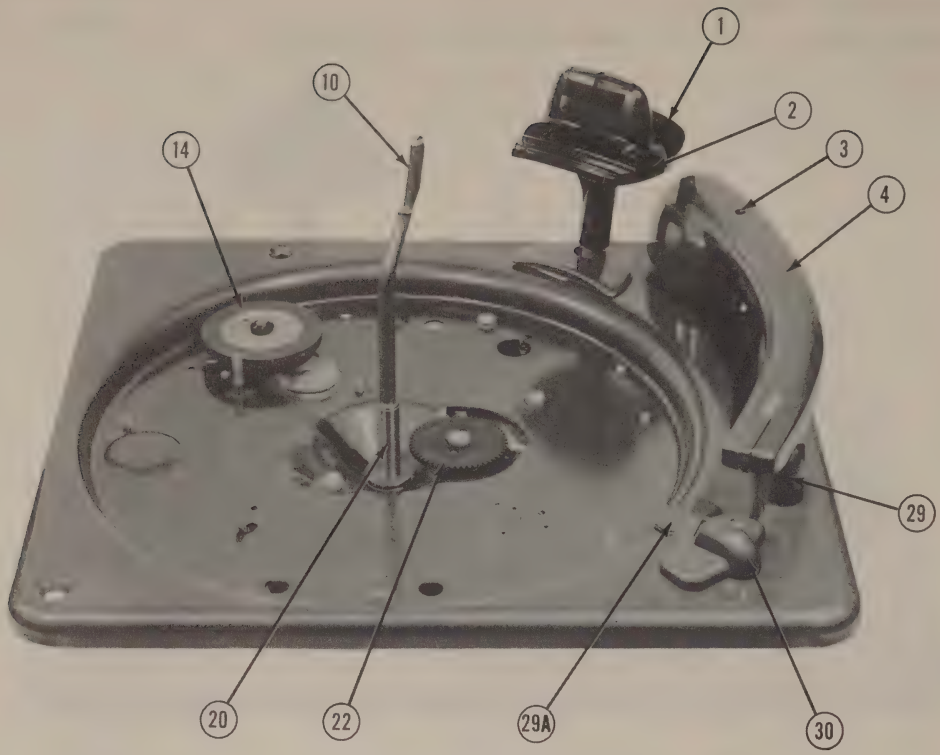
WEBSTER-CHICAGO
MODEL 133

WEBSTER-CHICAGO
MODEL 133



TOP VIEW LESS TURNTABLE

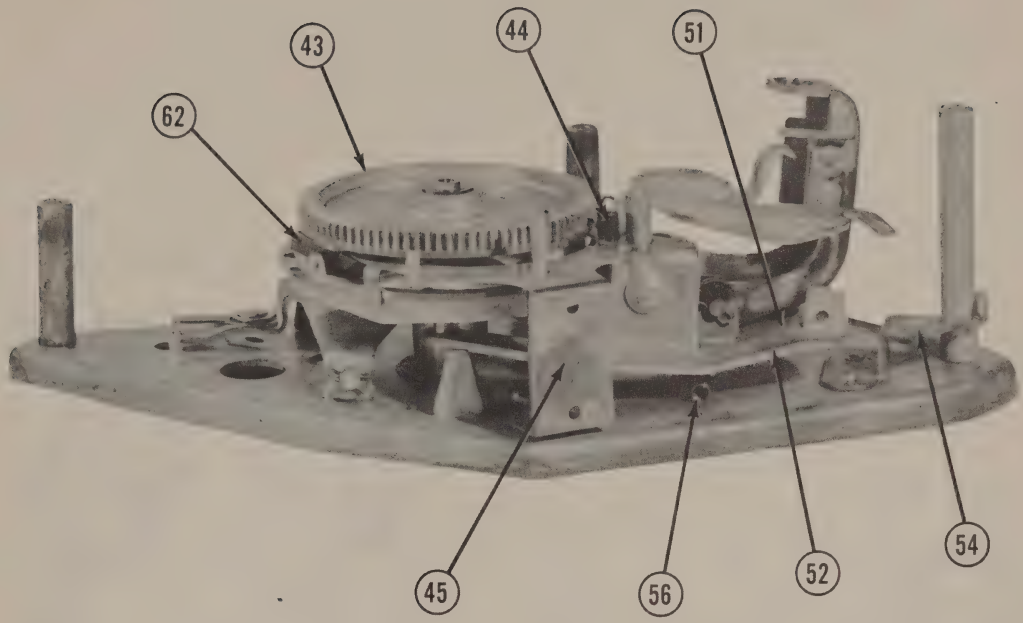
THE CHANGE CYCLE

The change cycle is started by a velocity trip mechanism. When the movement of the pickup arm toward the spindle is greater than ⅛" in ½ revolution of the turntable, the mechanism is actuated. As the pickup arm moves toward the center of the record, it moves the automatic trip arm (48) with it. The trip arm is connected to the pickup arm pivot shaft (8) and is held in place by the clutch weight (47). The trip arm (48) gradually approaches the velocity trip lever (45) and, upon contact, carries it with it; however, the main cam actuating gear (43) has four equally spaced projections on its circumference, which strike the velocity trip lever roller (44) as the gear revolves and forces the automatic trip lever and velocity trip lever back away from the tripping point. This does not affect the pickup arm because of the friction clutch. When the needle enters the eccentric groove upon completion of the record, the automatic trip arm moves at such a speed that it carries the velocity trip lever to the tripping point between projections on the main gear.

The velocity trip arm (45), when in position between cycles, holds the main cam pawl (62) away from the track on the lower surface of the main cam actuating gear (43). When tripped, the velocity trip arm no longer holds the pawl but allows it to engage the gear and causes the cam to rotate with the gear.

The main actuating cam has two cam surfaces on its lower side. The inside cam surface forms a track in which the stud of the pickup arm raising lever (52) rides. The outer cam surface actuates the rocker arm assembly (68) by means of the rocker arm roller (69). As the cam rotates, the pickup arm raising lever pushes up on the pickup arm raising disc (50) raising the pickup from the record. The stud of the raising lever is now moved toward the center of the cam, moving the pickup out clear of the record stack. As the cam continues to rotate, the roller (69) of the rocker arm moves down the incline moving the record selector post toward the spindle to drop a record.

The stud on the raising lever now moves back away from the center of the cam, moving the pickup to the set-down position. This position is determined by the selector lever compression spring (73). When the selector post is turned to the 10-inch position, pressure is applied by this spring to cause the raising lever stud to follow the outer edge of its groove in the main cam. With the record selector post in the 12-inch position, the spring is relaxed and the stud follows the inner edge of its groove.



SUB ASSEMBLY FRONT VIEW

The stud now moves up an incline, allowing the pickup to come down on the record. At the same time, the roller on the rocker arm moves back up its incline, allowing the record selector post to move back to normal position.

During the rotation of the cam, the velocity trip lever has been reset by the projections on the main gear; therefore, when the cam has completed one revolution, the hook on the velocity trip lever catches the pawl and disengages the main cam from the cam actuating gear, completing the cycle.

Records may be rejected at any time by sliding the control knob to the reject position.

Automatic Arm Rest Return Lever

If no record is resting on the spindle step at the beginning of the change cycle, the automatic arm rest return lever (74) will engage the pickup raising disc and prevent the pickup from moving in to the set-down position. The pickup arm, therefore, sets down on the pickup arm rest. The changer control knob may be moved to the off position and the records removed from the spindle.

ADJUSTMENTS

Pickup Arm Height

The needle should clear the top record of a full stack on the turntable by approximately ⅛". Adjustment may be made by bending the pickup raising lever (52) at the bend just below the point of contact with the pickup raising disc. Do not attempt to adjust by moving the raising disc.

Set-Down Adjustment

Normally, the set-down point may be adjusted by turning the set-down point adjustment pin (3) in the hinge. This pin is turned with a screwdriver and is reached through a hole in the top of the pickup arm. If this adjustment does not move the arm far enough, loosen the set screws in the pickup arm raising disc (50) and turn the disc until the adjustment is correct. Use a standard 10-inch record and adjust for a set-down point ⅛" from the edge of record. Check the adjustment with a standard 12-inch record and make a compromise adjustment, if necessary.

Record Selector Head Angle

The record selector post head assembly should be adjusted so that the curve of the record shelf lines up with the edge of a record on the spindle. This

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A PHOTOFACT "EXPLODED" VIEW

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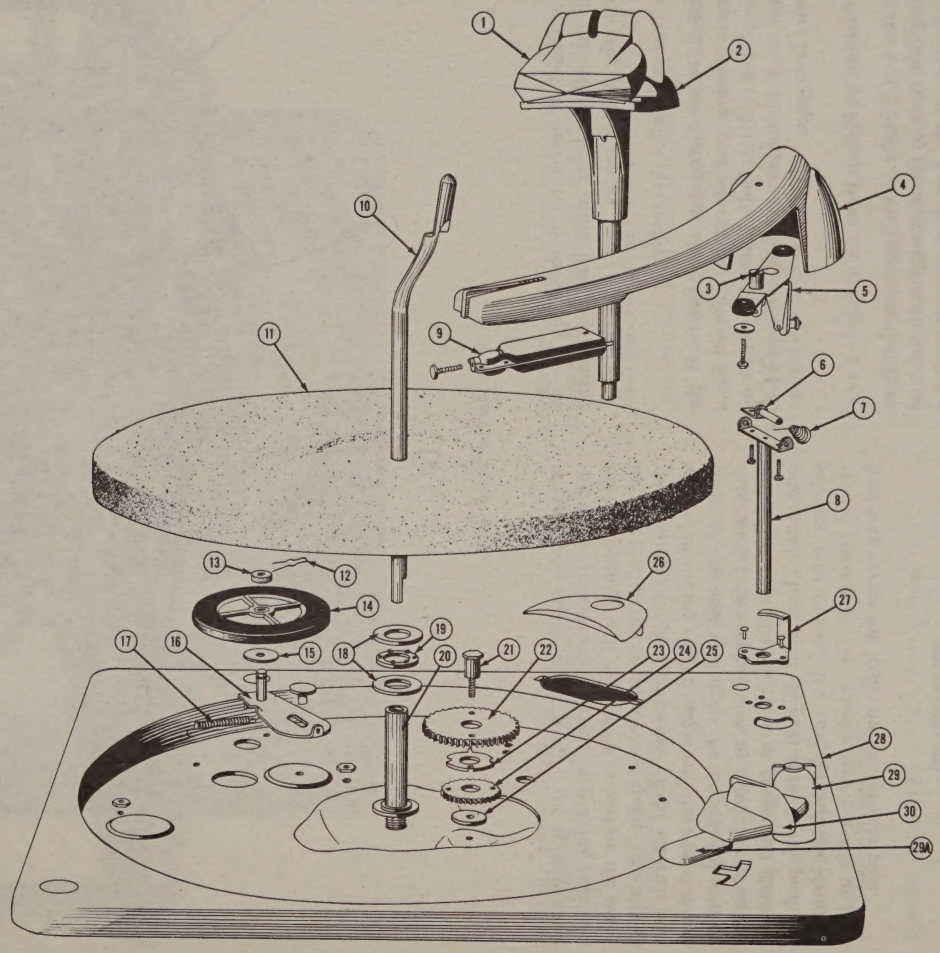
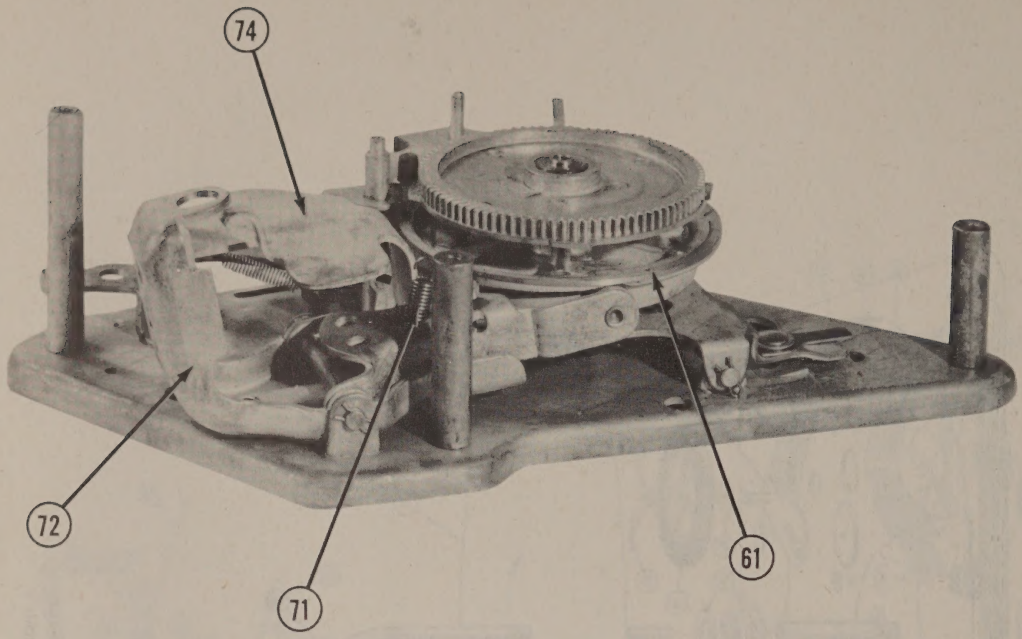




SUB ASSEMBLY REAR VIEW

may be adjusted, if necessary, by loosening the set screws in the selector lever collar (66) and turning the post to the proper angle.

Velocity Trip and Roller Assembly

The hook which disengages the pawl from the main cam actuating gear should be adjusted for a clearance of five to fifteen mils below the actuating gear. Too much clearance may allow the pawl to bounce and re-engage.

"Rest" Position of Pickup Arm

When the arm is in the "Rest" position, the lip of the raising disc rests in the space between the stud post and bracket. If the arm does not rest properly on the arm rest (29A), its position may be corrected by bending the lip of the raising disc. After making the adjustment, check the set down on a 12" record to be sure that the lip of the disc does not strike the bracket.

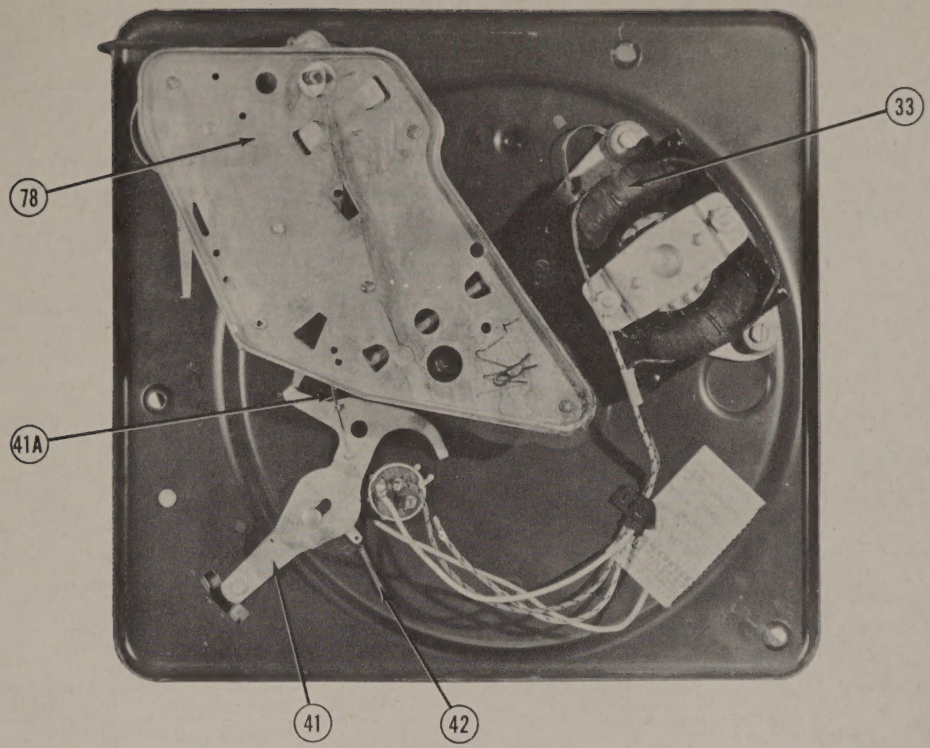
Record Selector Post Distance

At the beginning of the change cycle, the record selector post moves about 3/32" toward the spindle. This position is maintained until the pickup arm has completed its full lateral travel; then the record selector post again moves toward the spindle causing the bottom record to drop into playing position. Early dropping will usually be caused by the selector post resting too far from the spindle. This allows the record to catch on the edge of the selector post instead of sliding on the ledge, and the initial movement of the post will drop the record. To remedy this, wedge the rocker arm by inserting a screwdriver between the rocker arm pivot and the subplate stud. Then, with the heel of the hand, push the selector post toward the spindle until a standard record resting on the spindle step extends at least half way across the ledge on the selector post.

TROUBLES

1. ***Failure to Trip***
   - (a) Binding in velocity trip and roller assembly (45).
   - (b) Pawl (62) on main cam binding.
   - (c) Automatic trip arm (48) bent.
   - (d) Manual trip lever (41) bent.

2. ***Failure of Manual Trip***
   - (a) Manual trip actuating spring (41A) bent or broken.



BOTTOM VIEW

(b) Cam pawl (62) binding.
(c) Velocity trip and roller assembly (45) binding.

3. *Continuous Tripping*

(a) Too much clearance on hook (46.)
(b) Hook bent and not engaging cam pawl (62).
(c) Roller (44) on velocity trip assembly broken.
(d) Manual trip lever (41) binding.

4. *Motor Fails to Shut Off*

(a) Defective motor switch.

5. *Spindle Drops More Than One Record*

(a) Spindle latch sticking. Clean with carbon tetrachloride.
(b) Exceptionally thin records.
(c) Incorrect record selector spacing.

LUBRICATION

Lubrication should be sufficient for about a year of normal operation. When lubricating, be very careful not to allow oil or grease to come in contact with any rubber surfaces or the automatic trip arm clutch. If oil gets on any of these surfaces, it should be removed immediately with carbon tetrachloride.

1. *Use No. 10 Oil at the Following Points*

(a) Saturate felts on motor bearings.
(b) One drop each bottom bearing point, hole in bracket, and hole in main base plate for pick-up arm shaft.
(c) Turntable ball bearing assembly.
(d) Idler wheel felt washer.

2. *Use Lubriplate on the following Points*

(a) Idler wheel mounting link (16).
(b) Turntable bearing stud (20).
(c) Pickup arm swivel (5).
(d) Knife edge of raising lever (52).
(e) Main cam bearing. Remove sub-plate assembly to gain access to this bearing.

3. *Apply Sta-Put to the Following Surfaces*

(a) Teeth of main cam actuating gear (43).
(b) Track of main cam.
(c) Teeth of fiber gears (22 and 24).
(d) Raising lever bracket (53) bearing surfaces.
(e) Selector lever stop (65).

PARTS LIST

Ref. No.	Part No.	DESCRIPTION
1	49P037-C	Record weight
	46P126	Record weight spring
2	49X035-C	Record selector post assembly
3		Pickup arm set-down point adjustment pin (part of 5)
4	42P086-E	Pickup arm
5	21X285	Pickup arm swivel
6	11X386	Bracket for pickup arm balance spring
7		Pickup arm balance spring (part of 6)
8	11X385	Pickup arm pivot shaft assembly
9		Pickup cartridge
10	11X133	Spindle
11	11X138-E	Turntable and hub assembly
12	50P125	Hairpin clip
13	25P030	Felt washer
14	11X003	Idler wheel
15	25P046	Fiber washer
*16	11X395	Idler wheel mounting link
17	46P112	Idler tension spring
18	25P269	Turntable bearing washers
19	11X058	Turntable roller bearing
20	41P414	Turntable stud
21	41P333	Idler gear mounting screw
22	47P024	Large idler gear
23	45P342	Idler gear coupling
24	47P023	Small idler gear
25	25P284	Idler gear spacing washer
26	45P416-E	Record selector post escutcheon
27	45P191	Pickup arm lift stop bracket
*28		Main base plate
29	42P144-E	Pickup arm rest
29A	24P004-C	Needle pad
30	42P001-E	Control knob
31	25P333	Turntable bearing stud washer
32	26P687	Turntable bearing stud nut
33	15X096-1	Motor, 105-125 volt, 50-60 cycle
34	25P281	Motor mounting grommet
35	41P530	Motor mounting sleeve
36	25P367	Motor mounting washer
37	26P241	Motor mounting screw
38	25P367	Idler gear stud flat washer
39	25P222	Idler gear stud lock washer
40	26P046	Idler gear stud nut
41	11X083	Manual trip lever
*41A		Manual trip lever actuating spring
42	46P117	Manual trip lever tension spring
43	11X032	Main cam actuating gear
*44		Velocity trip lever roller (part of 45)
45	11X320	Velocity trip lever
*46		Velocity trip lever hook (part of 45)
47	41P576	Clutch weight
48	46P568	Automatic trip arm
49	23P009	Felt washer
50	11X227	Pickup arm raising disc
51	46P044	Raising lever tension spring
52	11X046	Pickup arm raising lever
53		Raising lever bracket (part of 52)
54	45P347	Pickup arm shaft bracket
*55		Raising lever bracket pivot shaft
56	46P139	Raising lever tension spring
*57		Velocity trip lever pivot shaft
*58		Main cam and gear shaft
59	25P343	Main cam washer
60	25342	Main cam retaining clip
61	11X033	Main cam assembly
*62		Main cam pawl (part of 61)
63	46P012	Selector shaft compression spring
64	25P300	Selector shaft compression spring washer
65	45P194	Selector lever stop
66	11X049	Selector lever collar assembly
67	26P316	Adjustment screw for rocker arm assembly
68	11X141	Rocker arm assembly
*69	41P418	Rocker arm roller (part of 68)
*70		Selector lever (part of 66)
71	46P161	Tension spring for selector post housing
72	45P583	Record selector post housing
73	46P011	Selector lever compression spring
74	11X079	Automatic arm rest return lever
75	41P421	Rocker arm pivot pin
76	50-125	Rocker arm pivot pin clips
*77		Rocker arm pivot ears
*78		Sub-plate assembly
79	50P125	Automatic arm rest return lever pivot pin clips
80	41P443	Automatic arm rest return lever pivot pin
81	50P160	Record spindle retaining clip

* *Not stocked for service*